

Productivity Mapping for a Reverse Logistics Warehouse with n series and m Parallel Processes

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Abstract

The Problem of mapping productivity in warehousing is a complex one with multiple ad hoc processes and series-parallel nature of material flow stream. This paper presents such a problem for returns warehouse with goods from multiple categories. Material flow begins from receiving of items into warehouse to storing them and another flow stems from picking of products to dispatch from warehouse. In between the flow inventory is stored in warehouse for a time period t_i . The paper takes up an instance of a return center warehouse and develops a productivity mapping process by using Time and Motion Study concepts. The warehouse operates with n processes in series and m in parallel. Overall flow of warehouse is divided into 3 sections namely Inbound, Inventory and Outbound. There are l number of ad-hoc processes supporting the (n+m) systemized processes, resulting in a total of $T_p = (n+m+l)$ processes. Descriptive statistics is used for determining cycle time (ct_i) from each and every process. Cycle time is used to establish a load handled by an operator for a shift of duration S by factoring in various allowances. This load is termed as IPP index for a process. IPP for each process (IPP_p) is modelled by factoring load categories and fractions flowing into different material streams to establish blended IPP for the entire warehouse (IPP_w). This index reflects the design productivity of the warehouse.

Keywords: E-commerce, Productivity, IPP, Inventory Management, ERP, Time and Motion Study, Industrial Engineering, Work Study, Material Reconciliation, Reverse Logistics, Descriptive Statistical Analysis, Supply Chain.