Production systems

Engineering

Production Systems By of [Word Count] Manual Assembly Line Manual assembly line is perhaps the most common production system across industries and countries. In its general sense, a manual production line refers to a system of production within which many workers are being assigned tasks in an organized manner so that each plays a role in the creation of a single or a range of products (Groover, 2007). One core feature of manual assembly lines is that each or a group of individual workers executes certain tasks at designated workstations or benches (Groover, 2007). Often, these workstations are located in a line, which a product follows as it progresses towards the end product stage. There are several factors that should be thoroughly considered by workers, managers and owners to effectively use manual assembly lines. These factors include but are not limited to the high- and medium-demand products, similar products being produced, possibility of dividing the work into segments and the impossibility of automation of tasks (Groover, 2007). There are several reasons for which manual assembly lines are favored by many producers, among them productivity. Several reasons explain the productivity of manual assembly lines. Advantages of Manual Assembly Lines The first advantage of manual assembly lines is labor specialization, which supports learning curves. Second, manual assembly lines have interchangeable parts, implying that components of a product are made to close tolerance (Li & Semyon, 2009). Third, manual assembly lines support work flow so that workers receive products at their stations through conveyor belts and other such machines. The fourth reason manual assembly lines are preferred is the existence of line spacing. In other words, workers at each stage have a time frame within which they have to complete their tasks and hand over the product to the next level (Li & Semyon, 2009).

The core features of manual assembly lines are sequence of workstations, human workers, assembly of products along a line and a content of work being performed at each station, components added progressively (Research, Industrial Systems, 2002). Examples of activities performed at manual assembly stations include but are not limited to press fitting, snap fitting, electrical connections, adhesive applications, spot welding, component insertion, arc welding, stitching, threaded fastening, soldering and stapling among others (Kalpakjian & Schmid, 2005). Disadvantages of this production system include inflexible production facilities, poor build qualities compared to other production methods and a considerably superior initial capital investment. It is also associated with repetitive jobs, resulting in worker motivational issues. The Diagram below shows a manual assembly line of Creations Technologies in Changzhou, China and a Lamborghini assembly line (www. motortrend. com). Virtual Prototyping Technique In historical times, initial ideas on production and product designs relied solely on designers’ and engineers’ judgment, perceptions and experiences. In these times, physical designs would be constructed and their likely performance and viability tested (Schaaf & Faye, 2007). However, the initial samples were highly likely not to perform as expected due to the absence of mechanisms of evaluating their performance prior to the creation of actual physical products (Schaaf & Faye, 2007). Unfortunately, engineers were forced to redesign and change their initial ideas and model a number of times due to the weaknesses identified with the initial unevaluated models. Currently, engineers have to contend with increasing pressure from clients to create and build high-performance and reliable products. In addition, there is currently increased pressure for designers to reduce the time frame within which products are designed and constructed. Consequently, quite many virtual prototypes are being developed (Schaaf & Faye, 2007). In these prototypes, engineering simulation software is applied to predict the performance of a part or an entire product prior to its physical production. Virtual Prototyping technique is thus the other production system widely in use in the contemporary manufacturing industry to develop various products. In its basic sense, virtual prototyping entails the application of Computer-Aided Design (CAD) and Computer-Aided Engineering (CAE) software to authenticate a proposed design prior to a decision being made to construct or develop the physical sample (Fouad & Aboitiz, 2010). Usually, 3D computer-generated geometrical shapes or parts are created then integrated or assembled and their mechanical fits, functions and motions tested. In other cases, just the beauty of the assembled product is the core objective (Schaaf & Faye, 2007). In virtual prototyping technique, the individual or integrated parts of a larger product may be accessed and opened using computer aided engineering software to imitate the behavior of the actual physical product. Advantages of Virtual Prototyping Technique Through virtual prototyping, engineers are able to evaluate the reliability and performance of various design options prior to their physical construction (Schaaf & Faye, 2007). This aspect of virtual prototyping helps in saving time and other resources such as money and labor that would be wasted in building and changing physical prototypes. A consequence of exploring and evaluating the reliability and performance of various prototypes is improved performance and quality designs (Aberdeen Group, 2006). Given that it is easier and faster to create a virtual prototype, the period taken to bring a product to the marked has also been largely reduced. A type of virtual prototyping commonly used by many manufacturers is the end-to-end prototyping. This type of prototyping accounts not only for the production of entire product and their parts but also the assembling and linking of all the entailed processes to the performance of a product (Schaaf & Faye, 2007). There are several positive effects of virtual prototyping in production systems. For instance, it has been reported that organizations that use virtual prototyping to a great extent enjoy benefits such as high revenues, reduced production costs, save time and achieve quality products (Schaaf & Faye, 2007). Importantly, users of virtual prototyping techniques reach the markets earlier than their counterparts who do not use this technique or use it at low levels. The notable disadvantages of virtual prototyping are: since some vital development steps could be overlooked or ignored, there is likelihood that real replication of a product or a system may not be achieved. Second, the need to get a cheap and quick working model may jeopardize the quality of product. System and parts overlook may result in never-ending rectifications and modifications. Finally, while a user may have high expectations, a designer may not be in a position o deliver. The diagram below summarises the use of virtual prototyping technique to create a physical product (www. rotosub. com). A diagram showing a collaborative virtual conceptualisation of a product (Retrieved from www. io. tudelft. fi).

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