Dynamic Cellular Remanufacturing System (DCRS) Design

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Abstract : Remanufacturing may be defined as the process of bringing used products to "like-new" functional state with warranty to match, and it is one of the most popular product end-of-life scenarios. An efficient remanufacturing network lead to an efficient design of sustainable manufacturing enterprise. In remanufacturing network, products are collected from the customer zone, disassembled and remanufactured at a suitable remanufacturing facility. In this respect, another issue to consider is how the returned product to be remanufactured, in other words, what is the best layout for such facility. In order to achieve a sustainable manufacturing system, Cellular Manufacturing System (CMS) designs are highly recommended, CMSs combine high throughput rates of line layouts with the flexibility offered by functional layouts (job shop). Introducing the CMS while designing a remanufacturing network will benefit the utilization of such a network. This paper presents and analyzes a comprehensive mathematical model for the design of Dynamic Cellular Remanufacturing Systems (DCRSs). In this paper, the proposed model is the first one to date that consider CMS and remanufacturing system simultaneously. The proposed DCRS model considers several manufacturing attributes such as multi-period production planning, dynamic system reconfiguration, duplicate machines, machine capacity, available time for workers, worker assignments, and machine procurement, where the demand is totally satisfied from a returned product. A numerical example is presented to illustrate the proposed model.
Keywords : cellular manufacturing system, remanufacturing, mathematical programming, sustainability