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Optimal policy for a multiechelon inventory system with remanufacturing. (English)

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Summary: We analyze a multiechelon inventory system with inventory stages arranged in series. In addition to traditional forward material flows, used products are returned to a recovery facility, where they can be stored, disposed, or remanufactured and shipped to one of the stages to re-enter the forward flow of material. This system combines the key elements of two simpler systems: the series system studied by Clark and Scarf (1960) and the single-stage remanufacturing systems studied by Simpson (1978) and Inderfurth (1997). We focus on identifying the structure of the optimal remanufacturing/ordering/disposal policy for such a system. In particular, we investigate whether the optimal policy inherits the basic structural properties of the simpler systems. We show that if remanufactured items flow into the most upstream stage, then this is the case. Specifically, the system can be solved by decomposition into a sequence of single-stage systems, with each downstream stage following an echelon base-stock policy and the most upstream stage following a three-parameter policy with a simple (and intuitive) structure. We show that similar results hold when remanufactured products flow into a downstream stage; however, in this case some modifications must be made. In particular, the definition of echelon inventory must be adjusted for stages upstream of the remanufacturing stage, and disposal of used items can no longer be allowed. We also compare the information required for managing this system to that required in the Clark and Scarf or Inderfurth settings, and we point out how the requirements are somewhat different depending on whether remanufacturing occurs upstream or downstream.

MSC:

90B05 Inventory, storage, reservoirs

90B30 Production models

Cited in **17** Documents

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