A SIMPLIFIED SOLUTION TO THE CONSTRAINED INTEGRATED MANUFACTURER-BUYER SUPPLY PROBLEM

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Abstract - This paper revisits the deterministic joint-vendor-buyer production-inventory problem and assumes that the production rate can be controlled. In recent decades, the integrated manufacturer-buyer supply chain problem has been widely studied by many scholars, as it provides benefits to both parties in terms of planning flexibility, information sharing and joint costs. To guard against unwarranted extreme solutions, such as too-abrupt production or, on the other hand, everlasting production aligned with demand, we place lower and upper bounds on the production rate. The manufacturer delivers the lot to the buyer in n (integer) smaller shipments, each of size q. An upper bound on the production cycle length is assumed (e.g., to enable the scheduling of maintenance periods or idle windows of time in which workers are not required to work.) In order to solve the problem mathematically, we suggest a sub-optimal nested formulation of the problem that utilizes existing formulas for $n^*(r)$ and $q^*(r)$ (where r denotes the demand-to-production rate ratio, r = D/P) for the unconstrained problem. Among the advantages of the suggested approach are that the solution is analytically derived, it is very simple to implement, and it yields a minimal joint cost that is close to the accurate formulation.

Keywords - Integrated Manufacturer-Buyer Problem; Bounded Production Cycle Length; Deterministic Models; Variable Production Rate