

## **Bucket Brigade with Stochastic Worker Pace**

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Work-sharing in production systems is a modern approach that improves throughput rate. Work is shifted between cross-trained workers in order to better balance the material flow in the system. When a serial system is concerned, a common work-sharing approach is the Bucket-Brigade (BB), by which downstream workers sequentially take over items from adjacent upstream workers. When the workers are located from slowest-to-fastest and their speeds are deterministic, it is known that the line does not suffer from blockage or starvation, and achieves the maximal theoretical throughput rate. Very little is known in the literature on stochastic self-balancing systems with work-sharing, and on BB in particular. This paper studies the basic BB model of Bartholdi & Eisenstein (1996) under the assumption of stochastic speeds. We identify settings in which conclusions that emerge from deterministic analysis fail to hold when speeds are stochastic, in particular relating to worker order assignment. Significantly, in a stochastic environment the BB can improve the throughput rate compared to parallel workers, despite the fact that no blockage or starvation occurs in the latter.

Bartholdi, J.J. and Eisenstein, D.D., A production line that balances itself. *Operations Research* 44 (1), 1996, 21–34.