Proceedings of the 7th Latin American Conference on Industrial Engineering and Operations Management
Panama City, Panama, August 4-6, 2026

Proceedings of the International Conference on Industrial Engineering and Operations Management

Publisher: IEOM Society International, USA DOI: 10.46254/SA07.20260093
Published: August 4, 2026

Production Scheduling in the Fruit-Based Beverage Juice Industry using System Dynamics

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Abstract

Production scheduling is a critical area in manufacturing, which involves resource assignment and job sequencing. In cases where there are shared production resources, production scheduling often focuses on minimizing the amount of non-productive time due to product changeovers. While there has been significant research regarding production scheduling, there is a mismatch between scheduling tools produced by researchers and actual scheduling processes used in practice. In the fruit-based beverage juice industry, a number of researchers have studied production scheduling, taking into account a number of industry-specific factors, inclusive of the lot-size determination for the mixing stage, the need for synchronization of the mixing stage and the filling stage, the need for periodic cleanings for food safety requirements, and the required cleanings for flavour changes. Past research in this area considered a mixed integer programming model and various heuristics for the lot-sizing and sequencing problem. This current research seeks to investigate production scheduling routines. It uses existing datasets, which included parameters such as number of products, mixing tanks, filling lines and time periods, time for temporal cleanings in the tank and line, maximum elapse time between temporal cleanings, changeover time from products, maximum and minimum production quantities for lot sizes, beverage production time, beverage filling time, product demand, and changeover costs, temporal cleaning costs, and inventory and backorder costs. Using a series of equations, Vensim PLE 10.3 software was used to develop causal loop and stock and flow diagrams to investigate how various production scheduling policies impact total changeover times.

Keywords
Production scheduling, Fruit-based beverage juice industry, System dynamics, Changeover times

Biography
Dr. Shellyanne Wilson is a Senior Lecturer in Operations Management in the Department of Management Studies, at The University of the West Indies (The UWI). She completed her B.Sc. in Chemistry and Management and her M.Sc. in Production Management, from The UWI, in 1996 and 2002 respectively; and her PhD focusing on manufacturing strategy from the University of Cambridge, in 2008. Her research interests include operations strategy, competitiveness, and value chain analysis. Prior to joining academia, Dr. Wilson worked in the manufacturing sector in the areas of quality management and manufacturing management.

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