

Brahim Rekiek  
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Advanced Manufacturing

# Assembly Line Design

The Balancing of Mixed-Model  
Hybrid Assembly Lines with Genetic



Springer

**Assembly Line Design The Balancing Of Mixed Model  
Hybrid Assembly Lines With Genetic Algorithms Author  
Brahim Rekiek Jan 2006**

**Jonathan D. Evans**



**Assembly Line Design The Balancing Of Mixed Model Hybrid Assembly Lines With Genetic Algorithms Author  
Brahim Rekiek Jan 2006:**

*Assembly Line Design* Brahim Rekiek, Alain Delchambre, 2006-04-21 Efficient assembly line design is a problem of industrial importance. Assembly line design is often complex due to the multiple components involved, efficiency, cost, and space. The aim is to integrate the design with operations issues, minimising costs. It is important to give the designer tools to help him meet the different objectives. 3 techniques based on the Grouping Genetic Algorithm are presented which can be used to aid assembly line design. Equal piles for assembly lines deals with assembly line balancing, balancing stations, loads, a method based on a multiple objective grouping genetic algorithm. MO GGA deals with resource planning, selection of equipment, balance for operation, deals with the changes during the operation of assembly lines. This book will interest technical personnel in design, planning and production departments in industry as well as managers in industry. It will also be of use to researchers and postgraduates in mechanical manufacturing or micro engineering.

**Application of Genetic Algorithm to Mixed-model Assembly Line Balancing** Jonathan D. Evans, 1996 *Assembly Line Balancing Using Hybrid Genetic Algorithms* Herbert Mapfaira, University of Nottingham (GB), 2002

**Balancing, Sequencing and Determining the Number and Length of Workstations in a Mixed Model Assembly Line** Fatemeh Mohebalizadehgashti, 2016 The single model assembly line is a traditional type of assembly line which assembles only one product in a large quantity. On the other hand, the mixed model assembly line assembles different models of a product simultaneously. Therefore, it gives a chance to companies to retain the market by satisfying various demands of customers. Because of this advantage, companies are motivated to change their assembly line from the single model to the mixed model. Balancing and sequencing problems are two important challenges in the mixed model assembly line. There are a large number of studies that have focused on balancing and sequencing problems separately. However, in this thesis, we study balancing and sequencing problems of the mixed model assembly line simultaneously. A mixed integer linear programming model is proposed to solve these problems simultaneously when the assembly line has the continuous motion and when common tasks between different models of a product can be assigned to different workstations. Objectives in this thesis are minimizing the length of workstations, minimizing the stations cost, and minimizing the tasks duplication cost. A branch and bound algorithm is exploited to solve the model. Following that, the proposed model is extended to show that it can satisfy the assembly line with the synchronous configuration. At the next step, a hybrid genetic algorithm which is a combination of the genetic algorithm and linear programming algorithm is employed to solve the proposed model for large size problems. Finally, numerical examples are presented to show how the proposed hybrid genetic algorithm solves the proposed model effectively.

**Assembly Line Planning and Control** Nick T. Thomopoulos, 2013-09-11 *Assembly Line Planning and Control* describes the basic fundamentals of assembly lines for single model lines, mixed model make to stock lines, mixed model make to order lines, and

for one station assembly The book shows how to select the quantity of units to schedule for a shift duration compute the number of operators needed on a line set the conveyor speed coordinate the main line with sub assembly lines assign the work elements to the operators on the line sequence the models down the line sequence the jobs down the line calculate the part and component requirements for a line and for each station determine the replenish needs of the parts and components from the suppliers compute the similarity between the models being produced and show applications use learning curves to estimate time and costs of assembly and measure the efficiency of the line The material is timeless and the book will never become obsolete The author presents solutions with easy to understand numerical examples that can be applied to real life applications

**Assembly-Line Balancing under Demand Uncertainty** Celso Gustavo Stall Sikora, 2022-01-11 Assembly lines are productive systems which are very efficient for homogeneous products In the automotive industry an assembly line is used in the production of several vehicle variants including numerous configurations options and add ins As a result assembly lines must be at the same time specialized to provide high efficiency but also flexible to allow the mass customization of the vehicles In this book the planning of assembly lines for uncertain demand is tackled and optimization algorithms are offered for the balancing of such lines Building an assembly line is a commitment of several months or even years it is understandable that the demand will fluctuate during the lifetime of an assembly line New products are developed others are removed from the market and the decision of the final customer plays a role on the immediate demand Therefore the variation and uncertainty of the demand must be accounted for in an assembly line In this book methods dealing with random demand or random production sequence are presented so that the practitioners can plan more robust and efficient production systems

**Balancing and Sequencing of Assembly Lines** Armin Scholl, 1995 The book on hand describes decision problems which arise in flow line production systems and proposes adequate solution methods Flow line production systems are present in different industrial environments and are utilized to manufacture a large variety of products Usually several models versions of a standardized product differing from each other by optional components and equipment have to be assembled jointly on mixed model assembly lines Two main types of decision problems have to be solved when such production systems are installed and operated The assembly line balancing problem consists of partitioning the assembly work of each model among different stations of a line This medium term problem is connected with the short term problem of finding an operating sequence of the models required to meet customer demands mixed model sequencing problem These problem types are discussed and classified in Part I of this work Different versions of balancing and sequencing problems are defined and arranged within a hierarchical planning system Since the optimization problems mentioned above are NP hard a lot of research work has been done so far in order to develop procedures which provide acceptable solutions within an appropriate amount of computation time on a computer system Part II of the book surveys existing procedures and presents a number of very promising new solution methods for several versions of both basic problem types Comprehensive numerical

investigations showing the effectiveness of the new methods are reported

**Genetic Algorithms for Assembly Line Design** Umesh Kulkarni,1996      **Genetic Algorithms for Combinatorial Optimization** Edward J. Anderson,Michael C. Ferris,1991      **Balancing Objectives for Mixed-model, Paced Assembly Lines** Sittichai Matanachai,1996      *Single and Mixed-model Assembly Line Balancing Methods for Both Deterministic and Normally Distributed Work Element Times* Dodla Nageswara Rao,1971

Line balancing is concerned with the optimal assignment of work elements to individual operators in an assembly line of a mass producing system This paper summarizes the assembly line balancing terminology the computational methods and objective functions applicable to a wide variety of assembly lines Single and mixed model situations for both constant and variable work element times are examined A Back Tracking Method of Assembly Line Balancing BALB is developed and programmed in FORTRAN IV BALB as a manual procedure was able to find an optimal solution to problems that other existing methods such as Helgeson and Birnie's positional weight technique could not yield In general BALB was also found to be simple and more efficient than the heuristic methods by Tonge Hoffman Mansoor and Arcus The computer program BALB accepts data for both single and mixed model ALB problems and considers both constant and variable work element times This program uses production shift time as the criterion for balancing the mixed model lines Numerical examples are used throughout the paper to illustrate the steps of various methods

*Balancing and Sequencing of Assembly Lines* Armin Scholl,1999-02-26 The book deals with two main decision problems which arise when flow line production systems are installed and operated The assembly line balancing problem consists of partitioning the work necessary to assemble the product's among different stations of an assembly line If several models of a product are jointly processed on a line this medium term problem is connected with the short term problem of determining an operating sequence of the models In Part I balancing and sequencing problems are discussed classified and arranged within a hierarchical planning system In the present second edition special emphasis is given to U shaped assembly lines which are important components of modern just in time production systems Part II is concerned with exact and heuristic procedures for solving those decision problems For each problem type considered a survey of existing procedures is given and new efficient solution methods are developed Comprehensive numerical investigations showing the effectiveness of the new methods and their superiority over existing approaches are reported

*Assembly Line Balancing under Uncertain Task Time and Demand Volatility* Yuchen Li,2022-09-10 This book introduces several mathematical models in assembly line balancing based on stochastic programming and develops exact and heuristic methods to solve them An assembly line system is a manufacturing process in which parts are added in sequence from workstation to workstation until the final assembly is produced In an assembly line balancing problem tasks belonging to different product models are allocated to workstations according to their processing times and precedence relationships among tasks It incorporates two features uncertain task times and demand volatility separately and simultaneously into the conventional assembly line balancing model A real life case study related to the mask

production during the COVID 19 pandemic is presented to illustrate the application of the proposed framework and methodology The book is intended for graduate students who are interested in combinatorial optimizations in manufacturing with uncertain input

**An Evaluation of Alternate Sequencing Methods for Balancing Mixed Model Assembly Lines**

Elaine Janice Labach,1989 A Genetic Algorithm for the Assembly Line Balancing Problem University of Wisconsin--Madison. Computer Sciences Dept,E. J. Anderson,M. C. Ferris,1990 We describe a prototype local neighborhood genetic algorithm for which communication is greatly reduced and give results of experimentation on several different neighborhood structures A possible asynchronous scheme is also mentioned

**Adaptation of Some Assembly Line Balancing Heuristics to a Mixed-Model Case** Alberto Fernández Pérez,2011 This Master Thesis propose to find the best heuristic solution for one of the types of Assembly Line Balancing Problem the SALP 1 in a line that needs to produce different models of the same product mixed model That objective was tried to achieve by adapting some of the best algorithms for simple lines Boctor Helgeson Birnie and Bedworth Bailey to solve that mixed models To solve the problem it will be probe some rules or make some changes in the problem in order to apply those algorithms At least the objective is to study with what algorithm and whit which changes in the problem we obtain the better results

**The Performance and Flexibility of Mixed-model Assembly Lines** Christophe B'egu'e,1995 **Assembly Line** Waldemar Grzechca,2011-08-17

An assembly line is a manufacturing process in which parts are added to a product in a sequential manner using optimally planned logistics to create a finished product in the fastest possible way It is a flow oriented production system where the productive units performing the operations referred to as stations are aligned in a serial manner The present edited book is a collection of 12 chapters written by experts and well known professionals of the field The volume is organized in three parts according to the last research works in assembly line subject The first part of the book is devoted to the assembly line balancing problem It includes chapters dealing with different problems of ALBP In the second part of the book some optimization problems in assembly line structure are considered In many situations there are several contradictory goals that have to be satisfied simultaneously The third part of the book deals with testing problems in assembly line This section gives an overview on new trends techniques and methodologies for testing the quality of a product at the end of the assembling line

**Multi-model Parallel Assembly Line Balancing Using Genetic Algorithms** Amirabbas Tabatabaei,2012 *An Efficient Genetic Algorithm Application in Assembly Line Balancing* Duminda Thilakawardana,University of Surrey,2002

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