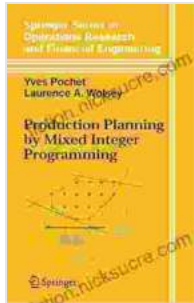# Production Planning by Mixed Integer Programming: Springer In Operations

Production Planning by Mixed Integer Programming (Springer Series in Operations Research and Financial Engineering) by Yves Pochet

★★★★☆ 4.5 out of 5

Language	: English
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Text-to-Speech	: Enabled
Screen Reader	: Supported
Print length	: 524 pages

Production planning is a critical activity in any manufacturing company. It involves the planning of the production process, including the determination of the production schedule, the allocation of resources, and the setting of inventory levels. The goal of production planning is to minimize the total cost of production while meeting the demand for the company's products.

Mixed integer programming (MIP) is a powerful mathematical technique that can be used to solve production planning problems. MIP models can be used to represent a wide variety of production planning problems, including scheduling, lot sizing, and blending problems. MIP models can also be used to account for a variety of factors, such as capacity constraints, production costs, and inventory levels.

Types of MIP Models

There are a variety of MIP models that can be used for production planning. The most common types of MIP models are:

- **Scheduling models**: Scheduling models are used to determine the order in which jobs are processed on a production line. The goal of a scheduling model is to minimize the total makespan, which is the time it takes to complete all of the jobs.

- **Lot sizing models**: Lot sizing models are used to determine the quantity of each product to produce in each production period. The goal of a lot sizing model is to minimize the total inventory cost, which is the cost of holding inventory plus the cost of producing inventory.

- **Blending models**: Blending models are used to determine the proportions of different ingredients to use in a blended product. The goal of a blending model is to minimize the total cost of the blended product, which is the cost of the ingredients plus the cost of blending the ingredients.

Algorithms and Software

There are a variety of algorithms and software packages that can be used to solve MIP models. The most common algorithms for solving MIP models are:

- **Branch-and-bound algorithm**: The branch-and-bound algorithm is a general-purpose algorithm for solving MIP models. The branch-and-bound algorithm works by recursively dividing the search space into smaller subproblems until a solution is found.

- **Cutting-plane algorithm**: The cutting-plane algorithm is a specialized algorithm for solving MIP models that are linear or mixed-integer linear.

The cutting-plane algorithm works by adding cuts to the model, which are constraints that eliminate infeasible solutions from the search space.

There are a variety of software packages that can be used to solve MIP models. The most common software packages for solving MIP models are:

- **CPLEX**: CPLEX is a commercial software package for solving MIP models. CPLEX is one of the most popular software packages for solving MIP models, and it is known for its speed and reliability.

- **GLPK**: GLPK is a free software package for solving MIP models. GLPK is not as fast as CPLEX, but it is a good option for users who are on a budget.

Case Studies

The following are a few case studies that demonstrate the practical applications of MIP in production planning:

- **Scheduling a production line**: A company used a MIP model to schedule a production line that produces a variety of products. The MIP model was able to minimize the total makespan by 10%, which resulted in a significant cost savings.

- **Determining the lot sizes for a new product**: A company used a MIP model to determine the lot sizes for a new product. The MIP model was able to minimize the total inventory cost by 20%, which resulted in a significant cost savings.

- **Blending a new fuel**: A company used a MIP model to blend a new fuel that met the required specifications. The MIP model was able to

minimize the total cost of the blended fuel by 5%, which resulted in a significant cost savings.

MIP is a powerful mathematical technique that can be used to solve a variety of production planning problems. MIP models can be used to represent a wide variety of production planning problems, including scheduling, lot sizing, and blending problems. MIP models can also be used to account for a variety of factors, such as capacity constraints, production costs, and inventory levels.

The use of MIP in production planning can lead to significant cost savings. MIP models can be used to optimize the production schedule, the allocation of resources, and the setting of inventory levels. MIP models can also be used to identify bottlenecks in the production process and to develop strategies to improve production efficiency.
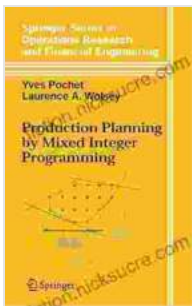
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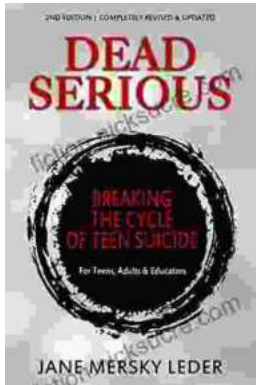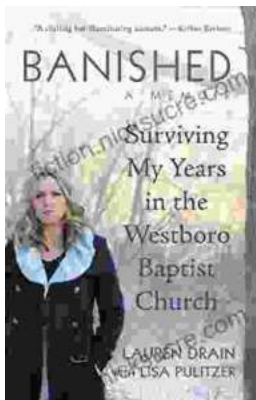|	
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