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Linear Programming Projects on Automobile Production

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ABSTRACT:
This task will explore the usage of linear programming in the vehicle enterprise. The venture will attention on the improvement and application of lp fashions to cope with an expansion of troubles in car production. The mission may also inspect the capacity advantages of using lp to improve the performance and profitability of automobile manufacturing.
The task could be divided into two primary stages. The first segment will contain the development of lp fashions to cope with particular problems in vehicle production. The second one section will involve the software of these fashions to real-global information. The outcomes of the undertaking may be used to evaluate the effectiveness of lp in improving the performance and profitability of automobile production. The venture is expected to make some of contributions to the sphere of operations studies. The task will broaden new lp models for addressing issues in vehicle production. The mission can even provide insights into the capability benefits of the use of lp to improve the performance and profitability of car production. The project is also predicted to have a positive impact on the car industry by using offering a valuable tool for improving manufacturing planning and decision-making.

Keywords: LPP,TRANSPORT,AUTOMOBILE

INTRODUCTION:

The automobile enterprise is a main contributor to the worldwide financial system, with a considerable impact on employment, alternate, and innovation. The production of cars is a complex technique that involves the coordination of a huge range of activities, such as design, manufacturing, assembly, and logistics.
Linear programming (lp) is a mathematical optimization approach that may be used to resolve a wide range of troubles related to the allocation of constrained assets. Inside the context of car manufacturing, lp can be used to address a selection of problems, inclusive of:
Production making plans: figuring out the top-quality blend of automobile fashions to produce if you want to meet demand while maximizing profits.
Aid allocation: assigning manufacturing responsibilities to unique workstations or manufacturing lines so that it will decrease fees or maximize throughput.
Inventory control: determining the surest tiers of inventory for uncooked materials, additives, and finished items.

Transportation planning: optimizing the routing of motors used to move substances and additives between extraordinary production facilities.

LITERATURE REVIEW

Oyedele, l. O., & oke, s. A. (2014). Application of linear programming model for production planning in an engineering industry: a case study. Journal of industrial engineering, 2014, 1-10

This paper presents a mathematical model for determining the best possible required capacity, workforce, and lot-size in a single piece flow based cellular manufacturing unit producing auto electrical parts. The model is based on linear programming and is designed to minimize the total cost of production while satisfying all constraints.

The authors begin by discussing the importance of production planning in the era of globalization and how it is a key factor for attaining success in any industry. They then go on to describe the existing practices of production planning in a single piece flow based cellular manufacturing unit producing auto electrical parts.

The mathematical model proposed in this paper is a linear programming model with three objectives: production cost minimization, production quantity maximization, and maximization of capacity utilization. The model is solved by considering each objective sequentially as a lexicographic approach.

The results obtained from the model are compared with actual observed values for validation. The authors conclude that the proposed model can be used as an effective tool for production planning in a cellular manufacturing with a single piece flow production type of auto electrical manufacturing industry.

In summary, this paper provides valuable insights into the application of linear programming techniques in production planning and highlights the importance of integrated planning for production, workforce, and capacity to attain success in any industry

Saravanan and senthilkumar (2018)

proposed a linear programming (lp) model for production cost minimization at an automotive parts manufacturer. The model considers various factors that affect production cost, such as raw material cost, labor cost, machine setup cost, and inventory holding cost. The objective of the model is to determine the optimal production plan that minimizes the total production cost.

The model is formulated as follows:

Minimize:

Total production cost = raw material cost + labor cost + machine setup cost + inventory holding cost

Subject to:

Production quantity constraints

Machine capacity constraints

Inventory level constraints

The model was applied to a real-world automotive parts manufacturing company. The results showed that the proposed model was able to reduce the total production cost by 10%.

The paper contributes to the literature on production planning and cost minimization. The proposed model is a valuable tool for automotive parts manufacturers who are looking to reduce their production costs.

The paper has several strengths. First, the model is based on a sound theoretical foundation. Second, the model is easy to understand and implement. Third, the model was validated using real-world data.

The paper also has some limitations. First, the model does not consider all factors that may affect production cost. Second, the model is not able to handle uncertainty in demand. Third, the model may not be applicable to all types of automotive parts manufacturers.

Overall, the paper makes a valuable contribution to the literature on production planning and cost minimization. The proposed model is a useful tool for automotive parts manufacturers who are looking to reduce their production costs.

Kumar and singh (2015) provide a comprehensive overview of the application of linear programming (lp) in production planning. The paper discusses the various types of production planning problems that can be solved using lp, as well as the advantages and disadvantages of using lp for production planning.

The paper identifies several types of production planning problems that can be solved using lp, including:

Product mix problems: determining the optimal mix of products to produce in order to maximize profit or minimize cost.

Production scheduling problems: determining the optimal sequence in which to produce products in order to minimize production time or cost.

Capacity planning problems: determining the optimal amount of production capacity to allocate to different products in order to meet demand.

Inventory planning problems: determining the optimal level of inventory to hold for different products in order to minimize inventory costs.

The paper discusses the advantages and disadvantages of using lp for production planning. The advantages of using lp include:

Lp is a well-established and widely used technique for solving optimization problems.

Lp is a relatively easy technique to understand and implement.

Lp can be used to solve a wide variety of production planning problems.

The disadvantages of using lp include:

Lp can be computationally expensive for large problems.

Lp can be difficult to use if the production planning problem is not well-defined.

Lp may not be able to capture all of the complexities of a real-world production planning problem.

Overall, the paper provides a valuable overview of the application of lp in production planning. The paper is a useful resource for anyone interested in learning more about how lp can be used to solve production planning problems

Application of mixed-integer linear programming in a car seats assembling process December 2011 pesquisa operacional 31(3):593-610
Doi:10.1590/s0101-74382011000300011

This article discusses the application of mixed-integer linear programming (milp) to optimize the car seat assembly process in a manufacturing company. The company was facing the challenge of increasing production capacity to meet growing demand. The authors used milp to model the assembly process, taking into account factors such as the number of workers, the number of workstations, and the time required to complete each task.

The milp model was used to evaluate different solutions for increasing production capacity. The best solution involved redistributing the work among the workers without buying new equipment or adding a second shift. Specifically, the authors found that by merging two workstations and separating some operations, they could increase production by 10% without incurring any additional costs.

The authors implemented the proposed solution in the manufacturing company. The results showed that the solution was successful in increasing production capacity by 10%. In addition, the company was able to achieve significant savings by avoiding the need to purchase new equipment or add a second shift.
This article demonstrates the effectiveness of milp for solving complex optimization problems in manufacturing. The authors' approach of using milp to model the car seat assembly process and evaluate different solutions is a valuable contribution to the field of production engineering.
In addition to the specific findings of the article, the authors also make a number of important contributions to the broader field of optimization. First, they demonstrate the importance of carefully modeling the problem at hand. The authors' milp model takes into account a number of important factors that affect the car seat assembly process. This level of detail is essential for obtaining accurate results.
Second, the authors demonstrate the value of using a systematic approach to evaluating different solutions. The authors used milp to evaluate a number of different solutions for increasing production capacity. This systematic approach helped them to identify the best solution for the specific problem at hand.

An introduction to linear programming problems with some real-life applications
April 2022
european journal of mathematics and statistics 3(2):21-27
Doi:10.24018/ejmath.2022.3.2.108
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This article provides an introduction to linear programming (lp), a mathematical tool used to optimize outcomes. The article discusses the history of lp, as well as its various applications in business, engineering, and transportation.
Some of the key points covered in the article include:
The definition of lp and its basic components
The different types of lp problems
The simplex method, a commonly used algorithm for solving lp problems
The duality principle, which relates lp problems to their corresponding maximization problems
The sensitivity analysis, a technique for analyzing the impact of changes to the input data on the solution to an lp problem
The article also provides several real-world examples of how lp is used to solve practical problems. For example, the article discusses how lp can be used to:
Determine the optimal product mix for a manufacturing company
Develop production schedules that minimize costs
Design transportation networks that are efficient and cost-effective
Overall, this article provides a comprehensive overview of lp. It is a valuable resource for anyone who is interested in learning more about this important mathematical tool

A linear programming approach for different serial machines scheduling with optimizing batch size in a flow oriented synchronized production
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Conference: 2011 international conference on innovation, management and service ipedr vol.14(2011)
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This article is about using linear programming to schedule production in a flow shop. The authors propose a novel approach to minimize costs by considering inventory, overtime, subcontracting, backordering, and machine capacity. They provide an example to illustrate their approach.

Kumar, R., & Singh, R.K.(2015). Linear Programming Techniques for Production Planning and Control: A Case Study of an Automobile Industry, International Journal of Advanced Research in Computer Science and Software Engineering, 5(7), 114-118

In a flow shop, products move through a series of machines in a predetermined order. The authors consider a production planning problem with precise demand and costs. They formulate the problem as a linear programming model and propose a solution method that minimizes the total cost of production.

The authors' approach considers the following factors:

Inventory costs: the cost of holding inventory.

Overtime costs: the cost of paying workers overtime.

Subcontracting costs: the cost of outsourcing production to other companies.

Backordering costs: the cost of not meeting customer demand on time.

Machine capacity: the limited availability of machines.

The authors' approach is able to find a production schedule that minimizes the total cost of production, taking into account all of the relevant factors. They provide an example to illustrate their approach.

Development of linear programming model for optimization of product mix and maximization of profit: case of leather industry

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This article proposes a linear programming (lp) model for optimizing product mix and maximizing profit in the leather industry. The authors consider various factors that affect profitability, such as product demand, production costs, and machine capacity. The objective of the model is to determine the optimal production plan that maximizes profit.

The model is formulated as follows:

Maximize:

Total profit = (product price per unit - production cost per unit) * production quantity

Subject to:

Product demand constraints

Machine capacity constraints

Production quantity constraints

The model was applied to a real-world leather goods manufacturing company. The results showed that the proposed model was able to increase profit by 15%.

The paper contributes to the literature on production planning and profit maximization. The proposed model is a valuable tool for leather goods manufacturers who are looking to increase their profits.

The paper has several strengths. First, the model is based on a sound theoretical foundation. Second, the model is easy to understand and implement. Third, the model was validated using real-world data.

The paper also has some limitations. First, the model does not consider all factors that may affect profitability. Second, the model is not able to handle uncertainty in demand. Third, the model may not be applicable to all types of leather goods manufacturers.

Overall, the paper makes a valuable contribution to the literature on production planning and profit maximization. The proposed model is a useful tool for leather goods manufacturers who are looking to increase their profits

PROBLEM STATEMENT:

A car manufacturer produces two types of cars: Sedans and SUVs. The production process involves two stages: Assembly and Painting. The assembly stage takes 2 hours for a sedan and 3 hours for an SUV. The painting stage takes 1 hour for a sedan and 2 hours for an SUV. The assembly stage has a maximum of 1000 hours available per week, while the painting stage has a maximum of 800 hours available per week. The profit per sedan is $5000, while the profit per SUV is $8000. How many sedans and SUVs should the manufacturer produce each week to maximize their profit?

Solution:

Let x be the number of sedans produced per week, and y be the number of SUVs produced per week.

The objective function is to maximize profit:

Profit = 5000x + 8000y

The constraints are:

2x + 3y <= 1000 (Assembly stage constraint)

x + 2y <= 800 (Painting stage constraint)

x >= 0 (Non-negativity constraint)

y >= 0 (Non-negativity constraint)

Solving these constraints using linear programming techniques, we get:

x = 200

y = 200

Variable	Value
Number of Sedans	200
Number of SUVs	200
Maximum Profit	$1,600,000

Therefore, the manufacturer should produce 200 sedans and 200 SUVs each week to maximize their profit.

RECOMMENDATIONS AND SUGGESTIONS

Optimize the production process: The company can use linear programming techniques to optimize the production process and minimize costs. This can involve developing a mathematical model that takes into account all the constraints and optimizes the production schedule to maximize efficiency.

Invest in automation: The company can invest in automation to reduce labor costs and improve efficiency. This can involve using robots to perform repetitive tasks, such as painting or welding, or using automated guided vehicles (AGVs) to transport materials.

Improve supply chain management: The company can improve supply chain management by using advanced analytics tools to forecast demand and optimize inventory levels. This can help reduce waste and improve efficiency.

Embrace sustainability: The company can embrace sustainability by developing eco-friendly products, using renewable energy sources, and reducing waste. This can help reduce the company's carbon footprint and improve its reputation among environmentally conscious customers.

Focus on customer satisfaction: The company should focus on providing excellent customer service to build a loyal customer base. This can involve providing timely delivery, after-sales support, and personalized services.

Invest in research and development: The company should invest in research and development to stay ahead of the competition. This can involve developing innovative products that meet the changing needs of customers.

Leverage digital marketing: The company should leverage digital marketing to reach a wider audience and build brand awareness. This can involve using social media, email marketing, and other digital channels to promote the company's products and services.

CONCLUSION

In conclusion, we have explored the topic of Linear Programming projects on automobile production through a literature review, problem statement solution, and recommendations. The literature review revealed that linear programming techniques can be used to optimize production planning and control processes in the automobile industry. The problem statement solution demonstrated how linear programming can be used to maximize profit by optimizing the production schedule for sedans and SUVs. The recommendations provided insights into how the company can improve its operations by focusing on customer satisfaction, investing in research and development, embracing sustainability, leveraging digital marketing, and optimizing supply chain management.

By implementing these recommendations, the company can improve its efficiency, reduce costs, and stay ahead of the competition. Linear programming techniques can help the company optimize its production processes and inventory management, while automation can help reduce labor costs. Embracing sustainability can help reduce the company's carbon footprint and improve its reputation among environmentally conscious customers. Focusing on customer satisfaction can help build a loyal customer base, while investing in research and development can help the company develop innovative products that meet the changing needs of customers. Leveraging digital marketing can help the company reach a wider audience and build brand awareness.

Overall, by adopting these recommendations and leveraging linear programming techniques, the company can achieve success in the highly competitive automobile industry

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