International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 06 | June - 2022 Impact Factor: 7.185 ISSN: 2582-3930

Systematic Analysis of Energy Planning in Industry

Amit Chauhan
Department of Electrical Engineering
Arya Institute of Engineering & Technology, Jaipur, Rajasthan
India
amitchauhan14122000@gmail.com

Neha Kanwar
Department of Electrical Engineering
Arya College of Engineering & Research Centre, Jaipur, Rajasthan
India
neha2532002@gmail.com

***Abstract*— Scarcity of resources, structural change as renewable energy sources development, and their related prices, such as rising resource prices or fines for defective manufacturing, force industrial enterprises to alter their environmental policies. In this area, there has been a lot of research done on in recent years, energy usages in production planning has gotten more observation, leading in So far, a vast number of research articles have been published on the subject. With the document in hand, we conduct a literature review on production planning that is based on energy. The goal of this research is to find core concerns that are comparable. Within stratified production planning, relevant properties along energy-oriented models as a result, we conduct a thorough evaluation of the literature and analyse and synthesis 375 research papers. We Using a revolutionary two-dimensional categorization system, classify the underlying literature.**

Keywords- Energy; production planning; literature evaluation

I. INTRODUCTION

Aside from basic concerns about sustainable manufacturing, one key source of concern is the usage of energy in industrial production. To convey this, research distinguishes two approaches to improve energy efficiency in industrial production. A possibility is found in investment in new energy-efficient manufacturing tools, also in the design of new products manufacturing procedures, Other option is to plan production in an energy-efficient manner (EOPP). While the previous approaches to technology speculations are typically associated with increasing manufacturing costs, production planning provides for enhancement in energy usage in the short duration and low expenditure expenses, make it particularly appealing for research and practice. A look at risk management in the context of energy-related businesses Production planning, for example, can be found. Stratified production planning is a concept used in industrial production planning. Based on these assumptions, we examine the pair of research questions (RQ) in this paper:- RQ1:- Is it feasible to condense the current papers on energy-oriented manufacturing? going to focus on a small handful of major topics? RQ2:- Can similar aspects of planning difficulties be identified in the literature? That allow for increased energy efficiency? The essay ready to presents a review of the state of the technique in energy-oriented production planning in order to answer these two issues. Topic bundling and a deep understanding of the fundamental aspects of planning challenges were utilised to enhance A entirely new categorization method for energy efficiency is offered. Furthermore, a sizable. The majority of the EOPP research publications discovered are cited throughout the text and available to the public. The research questions are debated. The rest of this report is organised as follows. The range of this study is provided in the next chapter, and it is distinguished from previous literature articles. The review approach for the literature search and analysis is presented. This report presents a categorization strategy based on 375 research publications. As a result,171 of these items must be described and linked to the categorization scheme. Characteristics that are commonly seen in energy oriented production planning models. The amount of dangerous gases in the environment has grown in the form of CO2,SO2,SO3.These chemicals reduce human life expectancy. We must maintain the environmental cycle in a proper manner. And make an effort to live a happy and prosperous life. The Taj mahal in India is an example of greenhouse gases. The same thing happened with carbon emissions. Nowadays, we must protect ourselves and our families from dangerous gases. We must become more environmentally friendly and stay close to nature, like Kerala and Karnataka have done in India. We supply numerical data. Analysis of the reviewed literature, as well as a prognosis on future research opportunities. This article comes to a close with a conclusion.

II. EXAMINING PREVIOUS WORK

The study suggested in this report is to provide an overview of energy-oriented production planning. Some analysis studies on production planning techniques that included energy concerns have already been published. Reference [2] provided an overview of energy-efficient production scheduling. The researchers categorised 87 arranging techniques published between 1990 and 2014 in their research. The authors created a study structure for assessing and classifying arranging models in terms of energy demand ,supply of energy and demand of energy. They talk about applications along the energy transformation series that could be affected by arranging and aligned arranging appeals to three interacting systems, namely, external conversion

systems , internal conversion systems, and a manufacturing company's production system (as the energy user). Reference [3] examined energy-efficient arranging options in smart manufacturing systems. Whole 90 works on production arrangement published in the middle of 2003 and 2019 were reviewed in terms of personnel category, model and problem solving approach, objective, and methodology Factors, as well as characteristics of energy usage The writers supplied information based on this cataloguing. A variety of numerical assessments of various parameters along the energy-oriented industrial chain scheduling. In ref. [1] 89 papers on energy-efficient production planning were assigned. The degree of ranked production planning and, as a result, broadened the opportunity of mid-way planning best production arranging, capacity planning, and lot-sizing methods. the authors evaluated the literature on energy-systematic production planning from a scientific and design-driven perspective in their study and provided a full description of it. Developed decision-making models that included energy considerations in.

III. METHODOLOGY

completing phases (IV), studies analysis and synthesis, and (A), research plan. We concentrate on papers that deal with energy in the factors of industrial production planning. As a result, the total comes to For our study, we included 375 publications published between 1983 and 2021.Work on the literature search procedure is summarised in a PRISMA flow diagram in annex A (Figure A1).

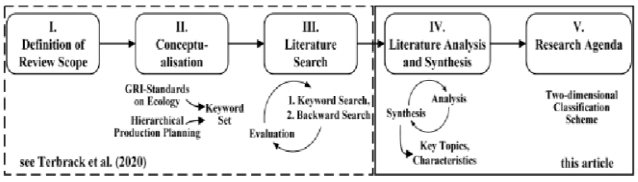


Figure 1:-Review methodology

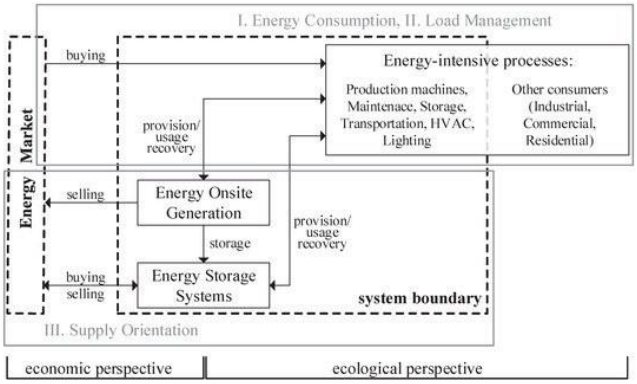
We continue our work from Ref. [4] in this paper by completing phases (IV), studies survey and synthesis, and (A), research plan. We concentrate on papers that deal with energy in the context of industrial production planning. As a

result, we have a total of There are 375 papers in our study that were published between 1983 and 2021 work. The literature search method is summarised in a PRISMA flow diagram.

A supplementary appendix (Figure A1). The studies is examined and synthesised in step (IV) in relation to the research question. Firstly, we look at which energy-specified targets are stated in the report purpose tasks, and how energy is modelled in the obstruction that underpin them. Every each specification is looked at independently. During the iterative process:1. Consumption of energy

2. Load management
3. A focus on supply

The two dimensions, as well as each particular class, are discussed more below. Several articles are listed as exemplary samples for each important topic and attribute, as well as their accompanying requirements. However, for a complete list of all the analysts is directed to the online appendix of this report when reading articles given to a class.



IV. SCHEME OF CLASSIFICATION

To address research question 1, we conduct an inductive review of the literature to identify essential areas within energy-oriented production planning. The primary themes specify which energy-related criterion is considered, either as an development target or as limitations inside a production planning technique. It is important to heed the primary subjects never mutually exclusive. The first essential subject, consumption of energy, is the examination of used energy in the context of production planning. Figure 2 depicts this discrepancy visually. It synthesises the pertinent domains and derives significant themes on planning of energy during production. The two essential part the energy market and the production scenario within a manufacturing industries, designated as a system limit'—as well as their interrelationships are depicted (see [13]).

Figure 2:-Relevant domains and significant themes arising from energy-oriented production planning .

A. Power Consumption

Table 1 lists the many features associated to key subject and detailed further below.

Key Topic 1: Energy Consumption

	Ecological	Economic
Objectives	Total Energy Consumption	Total Energy Consumption Costs
	Energy Consumption in Specific Periods	Energy Consumption Cost Savings
	Energy-Related Emissions (with constant energy-emission factor)	Penalty Costs for Energy Consumption
	Power-Saving Time	Energy Postponement Costs
	Unnecessary Heating Time	
	Deviation between Actual and Average Energy Consumption	
Constraints	Total Energy Consumption Threshold	Budget for Energy Consumption
	Energy Consumption Threshold per Period	
	Threshold for Energy-Related Emissions per period	
	Minimum Energy Consumption per Period	
	Energy Deviation Threshold	

Figure 3:-Power Usage and the Environment

Ecologically oriented techniques related to the main subject to describe the expansion of energy usage in a given time interval and handle power usage of a separate topic. as a production constraint energy consumption is studied in such study papers due to environmental concerns, with the purpose of increasing ecology in manufacturing. The cost of total energy consumption is the most typically seen monetary measure of energy use. Typically, the power utilization that is anticipated to be impacted by production planning is considered and product by the energy price. Aside from the costs and penalties associated with energy use in manufacturing, a previous author discovered another technique to handle energy usage economically. The authors evaluated extra delay costs that occurred when a post and, as a result, the necessary energy consumption were transferred to subsequent times due to a time low capacity. A cost rate was established for each shifted energy consumption unit (kWh).

B. Systems for Energy Storage

- Energy storage systems were assumed in 27 of the studied papers. As previously stated, energy storage devices may function on both the supply and demand sides of the energy equation. As a result, they allow the flexibility to use acquired or generated energy at a different time. Depend on time , we propose energy storage devices as an additional feature with potential for energy-efficient production planning. Aside from the different cost rates associated with ESSs (i.e., investment costs and wear costs), we extracted four basic features of how ESSs are modelled from the literature: storage capacity, charging (discharging) efficiency, charging (discharging) rate, and charging (discharging) time .
- Several of the evaluated papers included storage capacity as an underlying constraint when considering ESSs in production planning. In a single-machine scheduling model, for example, Ref. [5] assumed a fixed battery capacity. In this case, the battery is charged by renewable energy, and electricity is not used from the macro grid as long as the battery is charged. Similarly, Ref. [8] studied a microgrid consisting of external energy purchase, onsite energy generation, and a limited-capacity ESS in a lot-sizing and scheduling issue. Because of discharging concerns, Ref. [6], for example, assumed not only a maximum storage capacity, but also provided a range for the quantity of energy stored in the ESS.
- Such concerns for charging efficiency and charging rates of energy storage devices have been presented in a number of previous articles in a similar fashion. The scheduling technique in ref.[9], for example, includes charging and discharging efficiency, charging and discharging speeds, and ESS storage capacity. Essentially, efficiency rates less than 100 percent show energy loss during charging and discharging times, whereas values larger than zero address the fact that the energy storage is not instantaneously fully charged or drained.
- Furthermore, the authors considered that the ESS Sustainability could not be charged and discharged in the same period. Energy was given via the power grid and onsite generation using renewable energy sources in the article by ref.[7], and surplus energy could be stored in an ESS or fed into the grid. In a flow shop scheduling model, they estimate charging and discharging efficiency of 90% by ref.[10], with the ESS charging or discharging taking one hour.

C. Numerical Insights and Future Research Possibilities

We demonstrated our categorization strategy and gave several criteria and qualities for each class in the previous chapter. We can provide some numerical insights in the following because of the enormous quantity of studies and the exact process for assessing paper articles. Based on this, we propose a number of potential future research topics.

Growing integration of energy into mid-term manufacturing planning in one prospective route for future study. Until now,

31 of the 375 articles on whole manufacturing planning (master production) have covered energy. Because mid-term whole manufacturing planning establish capacity constraints and manufacturing number of product for product kinds and products, the subsequent planning levels, i.e., lot sizing and arranging, are influenced by these decisions. The elasticity for energy orientation relating to planning might be expanded by allocating 3 to 10 years manufacturing plan to energy concerns already.

In general, the authors believe that future studies will focus on research methodologies that may be classified as essential topics, such as energy-supply-oriented production of planning models, caused by the continuous transition toward renewable energies and awareness of resource scarcity. It is our aim, in particular, that the economic consideration of energy will not be the only major component of future research on EOPP at the expanse of ecological benefits.

CONCLUSION

We were able to infer three main subjects and five often discovered features within energy-oriented stratified manufacturing planning from this literature research. We did this by analysing and synthesising 375 research publications published between 1983 and 2021 that include energy consumption, load management, and energy supply direction across four distinct planning stages. Considerations of diverse energy usage parameters, alternative production resources, heat integration, multiple energy sources, and energy storage systems were recognised as a frequent model attribute that permits increases in energy efficiency across the examined literature. A major portion of the current literature on energy-oriented production planning was methodically categorised using this two-dimensional categorization methodology. We correlated our findings to 171 research publications and discussed various parameters throughout the text to each class in depth Furthermore, we identified four major topics for future investigation. We hope that by making our work available to the scientific community, we will encourage more study in the areas of production planning and energy efficiency. This article can provide a suitable description of aims and

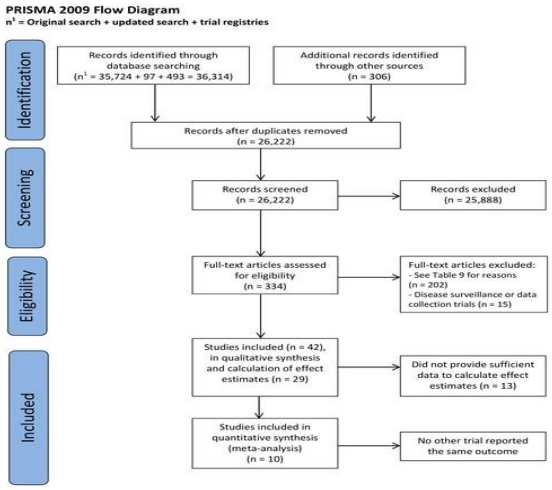


Figure A1. PRISMA 2009 flow diagram.

possibilities to increase energy usage through production planning for practice-oriented readers, and it will expectantly set out as a remoter stride towards green energy.

REFERENCES

[1] K. Biel and C.H. Glock conducted a systematic evaluation of the literature on decision support models for energy-efficient production planning. Computing and Industrial Engineering, 101, pp. 243–259. [Cross Ref].

[2] C. Gahm, F. Denz, M. Dirr, and A. Tuma. Energy-efficient scheduling in manufacturing firms: A review and study approach. Eur. J. Operational Research 2016, 248: 744–757. [Cross Ref].

[3] A review on energy-efficient scheduling in intelligent production systems. Gao, K.; Huang, Y.; Sadollah, A.; Wang, L. 2020, Complex Intell. Syst., 6, 237–249. [Cross Ref].

[4] Terbrack, H.; Frank, I.; Herrmann, F.; Claus, T.; Trost, M.; Götz, M. An Ecological Sustainability Literature Database in Industrial Production Planning. 2020, 12, 36–40. Anwendungen und Konzepte Der Wirtsch. [Cross Ref].

[5] C.H. Liu. Mathematical programming frameworks for single-machine scheduling issues with uncertainty in renewable energy. International Journal of Productivity Research, 54, 1122–1133. [Cross Ref].

[6] J.Y. Moon and J. Park. Smart production scheduling with timedependent and machine-dependent power costs by taking distributed energy resources and energy storage into account. International Journal of Productivity Research, 52, 3922–3939, 2014. [Cross Ref].

[7] A. Fazli Khalaf and Y. Wang. Energy-cost-aware flow shop scheduling taking intermittent renewables, energy storage, and real time electricity price into account. [Cross Ref] Int. J. Energy Res. 2018, 42, 3928–3942.

[8] M.G. Wichmann, C. Johannes, and T.S. Spengler. Energy-oriented lot-sizing and scheduling using energy storages. Int. J. Production Economics 2019, 216, pp. 204–214. [Cross Ref].

[9] Hour-Ahead Price Based Energy Management Scheme for Industrial Facilities, Huang, X., Hong, S.H., and Li, Y. IEEE Transactions on Industrial Informatics, 13, 2886–2898, 2017. [Cross Ref].

[10] A Multi-criteria MILP Formulation for Energy Aware Hybrid Flow Shop Scheduling, S. Schulz. Volume 23, pp. 543–549. Springer: Cham, Switzerland, 2018. [Cross Ref].