

Improvement Analysis of Production Planning and Control System

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Article Highlights

- Identified production planning and control system problems affecting manufacturing processes;
- Man, machine, material, and methods related problems using a fishbone diagram
- Analyzed problems with Pareto analysis and then developed a flow chart

Abstract

This study is of serious concern to increase the productivity and efficiency of the Ethiopian pulp and paper manufacturing company. The goal of this work is therefore to discover the problems that lead to poor company production planning and control systems. Methods used to gather and interpret data by observations, interviews, questionnaires and reports are then defined using Pareto analysis and fish-bone diagram methods such as labor efficiency and machine usage, energy costs, turnover of workers, production planning and control structure, delivery date results, maintenance costs, low demand, and resource estimation, bottleneck, Poor production schedule, capacity estimate, downtime, capacity planning, master production schedule, demand forecasting, and overall production planning.

Research findings, therefore, indicate that Capacity Planning, Master Production Schedules, Demand Forecasting, and Aggregate Production Planning are some of the key issues leading to poor capacity planning. The study concludes that the model to improve the company's production monitoring and scheduling related problems has been established and increased productivity by 85 percent.

Keywords: Production Planning and Control • Capacity Planning • Master Production scheduling • Aggregate Production Planning • Demand Forecasting

Introduction

Planning and management of manufacturing are the direction and alignment of the company's resources towards the achievement of the pre-defined objectives. It helps to understand the continuous flow of materials at the proper time and consequently, the consistency needed. Production training requires a sequence of activities carried out formerly than proper production. These consist of the production planning, the economic volume of the batch, the dispatch of targets, and the sequence of operations. On the other hand, production administration ensures the execution of all production plans, such as initiation, dispatching of goods, monitoring of production activities, among others. Production planning and control permit for the execution of the plans set out along with the planned scheduling of work, the task of workloads to machines and humans, as well as the appropriate flow of work. However, processing itself is an organized activity that leads to the change of inputs into usable goods. A variety of things to do are concerned with a successful production. These include the efficient use of natural assets such as manpower, finance, machinery, materials, and time. [1-3].

The pulp and paper (P&P) industry convert fibrous raw materials into pulp, paper, and paperboard. During an initiative, raw materials are processed into pulp (in the digester) and during a second step paper and paper products are produced out of this pulp [4]. These two steps are often processed on separate plants or combined into an integrated mill. P&P mills are complex systems, consisting of several processes with storage tanks in between. Disturbances

in one process tend to propagate to other processes, leading to production losses, unnecessary rate changes (which further cause quality disturbances and undesired wear on equipment), an increase of the environmental load of the mill. The propagation of disturbances can cause enforced shut-downs. The start-up of the process after this kind of disturbance also can be problematic. All of those factors can cause considerable economic losses [5]. Disturbance management may be a production control problem, typically neglected within the planning process. Still, some works within the literature have attempted to link both activities. The pioneering work provided by Alsholm and Pettersson (1969) [6] and Pettersson (1970) [7] tried to keep an appropriate level in each tank, to avoid the propagation of disturbances.

Pulp and paper making is a precise and complicated process, to achieve a product of the specified composition, texture, and quality, even slight deviations can adversely affect the output. Therefore, the importance of proper approach to production planning and control system helps in Ethiopian pulp and paper share company (EPPSC) is that the system reduces deviation from the production plan and Production loss through disturbances and thereby enhance productivity. Tight control of pulp and paper processes enables optimizing operating costs, operational stability, capacity utilization, and product quality – key factors behind sound productivity [8]. The changing business environment during which manufacturers are acting creates the necessity for more effective production processes planning and control methods which will affect uncertainties inherent in internal processes and external deliveries. The decreased production costs end in more profitable business and a high return on investment.

Monitor progress in the production process includes, minimized grade change losses at the paper machine, minimized delays in customer deliveries by providing the proper delivery date at the sales phase by having the ability to reply the unexpected situations at the mill, excellent trim results with minimal losses, taking under consideration multi-stage trim problems, improved finish line operations by indicating possible bottleneck by understanding the overload situations in advance, enhanced customer service by providing real-time access to the production and planning status of the orders with dynamic re-scheduling for late order, etc. Therefore, one of the most areas

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for productivity improvement is that the production planning and control system, therefore this research paper focuses on the way to improve the productivity of EPPSC through effective production planning and control systems.

The survival of any company is strictly linked to its competitiveness on the market. The higher it is competent, the better its existence will be. In order to deal with this dynamically changing demand, production companies are trying to identify the most problems they face in their day-to-day activities. According to the survey carried out in 2019-20 of the annual budget year a report on the performance of paper machine production was drawn up and the capacities to be achieved were 10700 tons/year and 9300 tons/year respectively. However, the real output is 4.652.69 tons/year, which is the actual production Vs the production potential is 43.5 per cent.

Unused working time 2019-budget year performance report 15099 hours, major downtime analysis 2992.9 hours lost and 3292.2 tons lost. The production delivery dates specified by the production planning and control section of the company are not usually met. It shows that the company operates below its capacity and faces productivity problems mainly due to its lack of production planning and control systems. Although some of the production planning control system functions are used by the company, they are unorganized, incomplete, underutilized equipment and labor force. The main problems faced by the company's manufacturing sector are identified as follows: failure to fulfill its production plan delayed response to customers on product status, reduced labor efficiency and utilization, high energy and downtime costs, high maintenance costs, unstable PPC structure and high turnover.

The aim of this research paper is to investigate the performance analysis of the production planning and control system implemented in the Ethiopian pulp and paper industry. Finally this study modifies the existing PPC structure by developing a new PPC flow-type model.

As a result, barriers to the development and implementation of production planning and control systems are also studied. The objective was broken down into the following research questions:

- How are proper production planning and control systems developed and what type of parameters are used to measure the performance of production planning and control systems in the Ethiopian pulp and paper industry, and how are they integrated, controlled, communicated and implemented within companies?
- What are the barriers that hinder the implementation of the company's existing production planning and control system in the production process with improved productivity in the Ethiopian pulp and paper industry?

The research paper is organized as follows: Section 1 Abstract, Section 2 Introduction,

Section 3, reviews the literature on production planning and control, Section 4 Methodology, how this research is carried out and described to achieve a useful result, Section 5, Presentation and interpretation of data on cause and effect diagrams and Pareto Analysis to investigate the few vital and useful problems associated with the company's a production planning and control system; Section 6, Result and discussion identifies areas for improvement, the model is created, and Section 7 presents the findings and recommendations.

Literature Review

One of the most significant PPC challenges, instead of preparation, is managing production, since disruptions and accidents common to the production process may interrupt the original program, causing delays and extra costs. In order to make this PPC viable, it is important to study its evolution over time and thus the factors that contributed to the changes. These causes will indicate the influence and interaction of all sectors involved in the production process [8].

PPC shall take into account an activity involving areas of business or a project to achieve the productive objectives of an organization aiming to systematize its processes taking into account the efficiency and effectiveness aspects, i.e. PPC shall have as its essence the implementation of a program of organized actions to achieve the lowest possible cost within the shortest time possible [9,10].

Santos and Almada-Lobo (2012) [11] and later approached by Figueira et al. (2013) [12], a simulation model was suggested for the optimization process for the preparation and scheduling of integrated pulp and paper mills.

Nyhuis & Wiendahl(2009)[12-14], which analyzed the efficiency of the production system, assess the achievement of goals such as short lead times, low work-in-progress (WIP) levels, high capacity utilization and high due date reliability.

Research Gap

From the above literature survey, it has been determined that most researchers are involved in power cost minimization and logistic performance measurement, and a few researchers are looking at the overall performance of the production system. However, a new model has been developed in this research paper, primarily based on the current organizational structure that improves the company's productivity. This research paper examined the relevance of manufacturing planning and production control system in the pulp and paper industries.

It is vital to observe that the focus of all these studies was to bypass the manufacturing planning and control system, which addressed service, logistics, overall performance measurement, and minimization of power costs. Moreover, it is not simply understood "why customer satisfaction, power cost minimization, logistic and overall performance measurement" from this factor of view the researcher focused on addressing these issues, however, will not improve the productiveness of the enterprise except appropriate production planning and control system. However, it is vital to understand the integrated approach of the company's production system to solve the issues that contribute to poor capacity planning. Moreover, the present study helps to improve the existing structure, by creating a new model for the implementation of the production planning and controlling system of the industry.

Methodology

Quantitative and qualitative methods of information have been used in this analysis. Interview, discussion, and questionnaire methods have been used to collect primary information. The secondary data sources used were technical documentation and annual reports that would help to gather information on the study. Journals, books, and websites have been provided to improve research into the truth and evidence of science and technology.

Presentation and analysis of data

The analysis of the data is carried out by measuring the overall efficiency of the equipment (OEE), the utilization of the machinery, using the cause and effect diagram process. The data collected was analyzed and inferred by the Pareto analysis. Paper production waste during the process, energy consumption, machine maintenance costs, and root cause of the problems have been investigated and the relevant solutions techniques have been presented in the study.

The company's paper production performance report has been summarized in Figure 1 for the last four years from 2016-2019.

The average percentage of paper production wastage for the last four consecutive years from 2016-2019 is shown in Figure 2.

Reasons for production wastages are due to technological limitations, less awareness about wastage, knowledge about energy costs, the problem of communication flow, material wastage, power wastage, and equipment

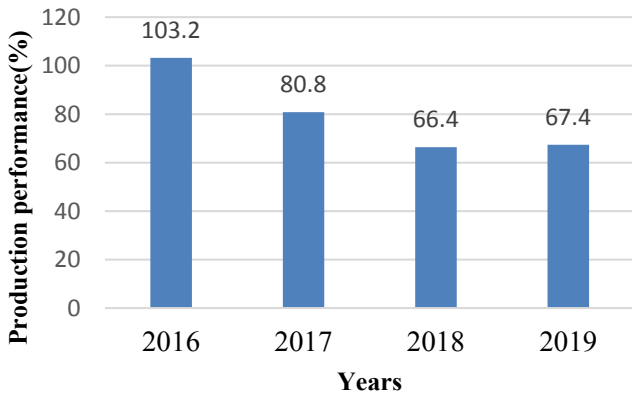


Figure 1. Paper production performance analysis through data collected by questioners from top Management.

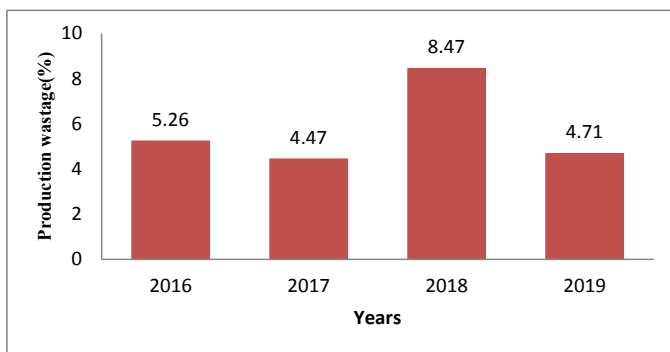


Figure 2. Paper production wastage percentages through data collected by questioners from top management.

wastage. From the observation, the year 2018 headed more production waste due to unstable schedule, inaccurate information about actual demand, and unbalanced batch production. The demand forecast every year is essential to minimize production wastage.

Downtime

The data shown in Figure 3 presents the company's downtime with a relative loss of paper in tons and hours.

Downtime in every year between financial years, 2016-2019 were presented in Figure 4. The problem-related company downtime can identify and includes Poor production performance, lack of skilled manpower, high maintenance cost, poor sales performance, and low production capacity utilization.

The main reasons for the downtime are due to power interruption, shortage of broke, lack of order; machine failure/poor maintenance, and shortage of raw material. To reduce unwanted downtime can be minimized by job order scheduling, un-interrupted power demand, and trained maintenance worker.

Manpower utilization

To investigate the performance of the 2019 year budget for paper production plan hours Vs actual hours and their loss hours are shown in Figure 5.

Unutilized working time in the budget year 2019, performance report is as shown in Figure 6.

In 2019, it was reported that the total unutilized working time was 15099 hours which means the factory loses 21138.6 tons of paper. The root cause of the problem is due to the lack of skilled operators and the threat of chemical hazardous environment and health protection/health plan.

Manpower turnover

Manpower turnover from the 2016-2019 budget years (Source from EPPSC HRM) is as shown in Figure 7. The data shown depicts the increment

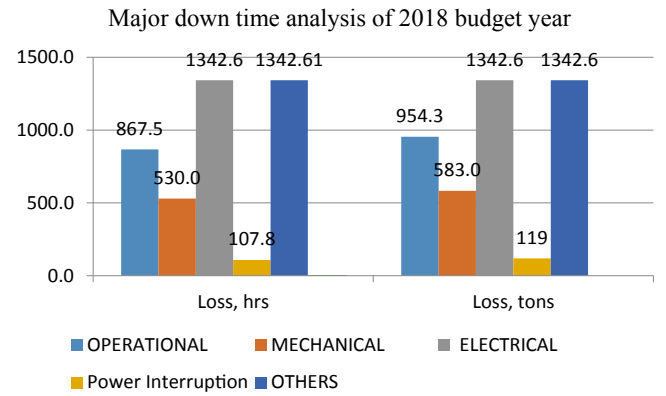


Figure 3. The company's downtime with relative loss in tons and hours.

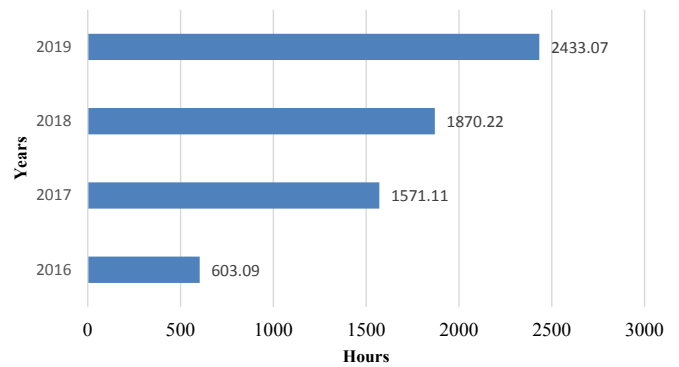


Figure 4. Downtime in every year between 2016-2019.

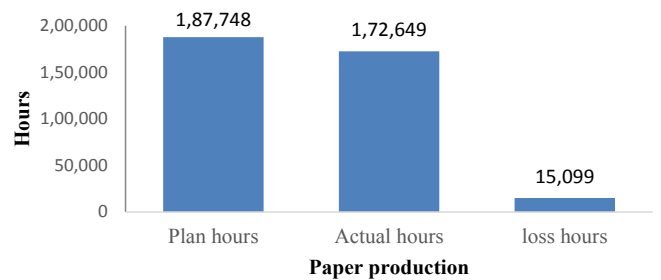


Figure 5. Paper production plan hours' Vs Actual hours.

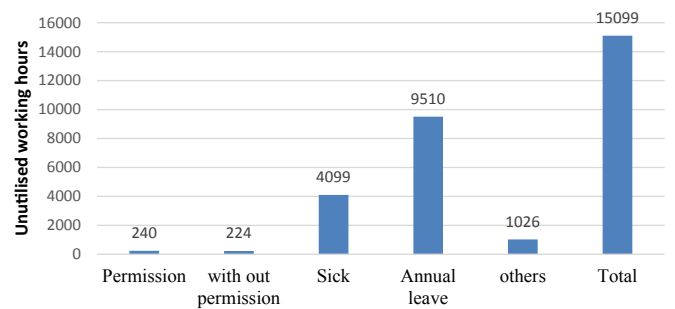


Figure 6. Unutilized working time in the budget year 2019 performance report.

in manpower turnover of the company for the last four years. There is a constant demand for skilled worker enforcement and development of human resource policy needs to be ratified in the company's recruitment decision.

Capacity utilization of the plant

The designed, attainable, and attained Capacity utilization of the plant of EPPSC, for the year 2019 is presented in Figure 8.

It can be observed that the company is utilizing its plants below the attainable value in all plants due to operation planning, procurement of materials, and average utilization rate of the individual employee in the organization.

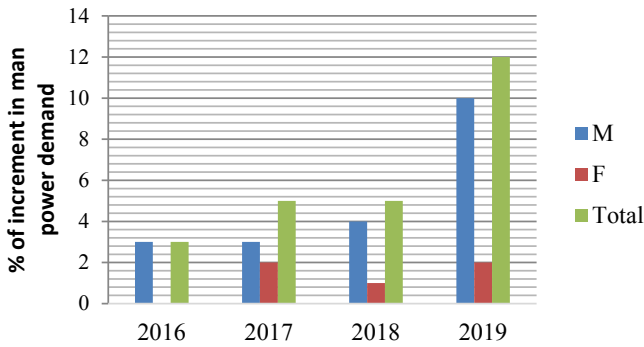


Figure 7. Manpower turnover from 2016-2019.

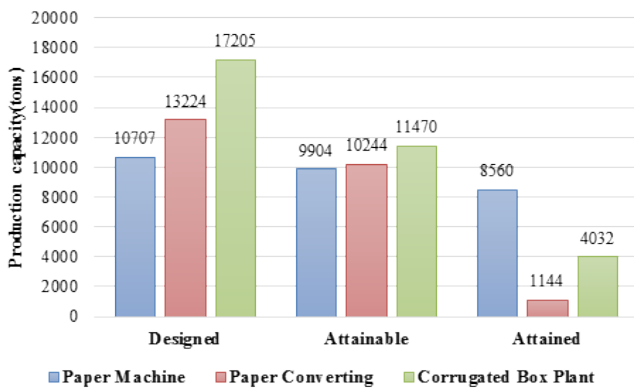


Figure 8. Enterprise Capacity utilization of the plant in 2019.

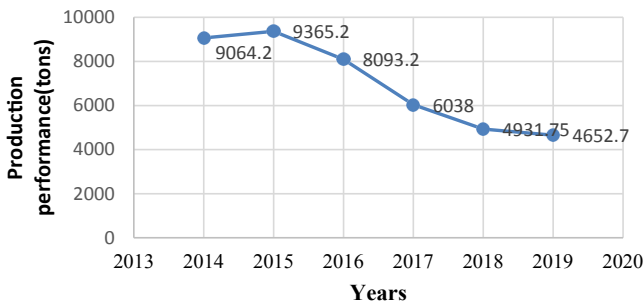


Figure 9. Paper performance report for the consecutive six years (2014-2019).

Paper production performance

To observe the trend of production performance of the last six budget years is shown in Figure 9. It has been observed that there is a continuous reduction of paper production performance of the company except for the 2015 year. Reasons for the factory to work with limited capacity due to problems on attracting target market, deterioration of machines, shortage of raw materials, unavailability of orders of raw materials, and shortage of spare parts for depreciating parts of the machine.

Maintenance cost

The critical machinery repairing and maintenance costs are shown in Figure 10. From this data, it has been observed that the company's high repair and maintenance cost share of main plants to give due consideration during preventive maintenance planning and bottleneck machinery analysis.

Energy utilization

The company spends about 285,710.92 Dollars' high energy cost for electricity and fuel cost in 2018/2019 is as shown in Figure 11. The observation of data shows that more fuel and energy utilized by the machine in paper production. There is more demand for skilled maintenance/service personal in the paper machine and preventive maintenance/Total productive maintenance (TPM)

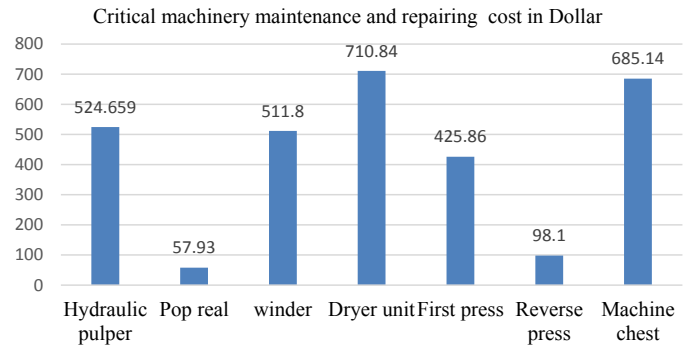


Figure 10. Critical machinery maintenance and repairing costs.

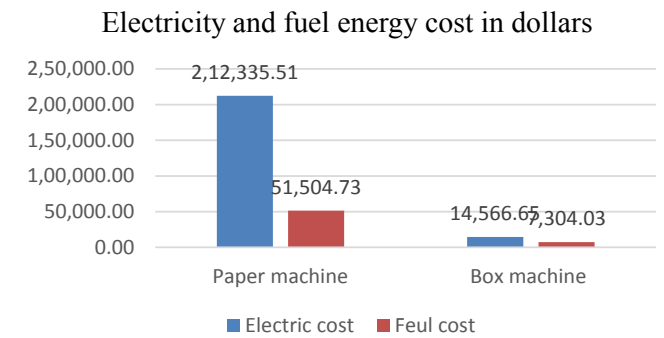


Figure 11. Electricity and fuel energy costs of the company.

warranted in the papermaking machine.

Pareto diagram analysis

Table 1 shows the data analysis through the Pareto diagram. This analysis is made to identify the vital few problems to which the company should give priority to solve its PPC related issues. To start the analysis it's found to be important to categorize the identified PPC-related problems into the respective PPC activities and analyze their percentage share from the total number of selected problems (Tables 1 & 2, Figure 12)

From the above Pareto analysis (as in Figure 12), the problems related to capacity planning (CP), Master production schedule (MPS), Demand forecast (DF), Aggregate production plan (APP) are found to be the vital few problem categories. The above categories contributed to 85.59% (capacity plan alone contributes 61.54%) and need to address the issue and will improve the PPC performance. Therefore, solving only problems in the capacity planning (CP) category will solve major problems, and also the remaining three vital problems grouped under MPS, DF, and APP will also be indirectly related, discussed in this study.

Cause and Effect Analysis

To identify the poor capacity planning performance of the company, the cause and effect analysis using the fishbone diagram is shown below in Figure 13, which shows the main categories, primary causes, and secondary causes of poor capacity performance-related problems.

Results and Discussions

The vital PPC related problems are identified and selected. First of all, the PPC related problems were identified through different methodologies. Then the problems were categorized under their respective PPC activities. By using the Pareto diagram the critical area which needs a priority for improvement is identified by using Pareto analysis, see Figure 12. Among those PPC activities, capacity planning got the largest share, 61.54%. By focusing on those capacity planning related problems cause and effect analysis is done

Table 1. Categories of identified problems related to PPC activities.

S/N	Categories	Identified related PPC Problems	Percentage Share	Remark
Production planning				
1.	Demand forecasting	The actual cost of production, time of each operation, and forecasting plan are not properly assessed and recorded. The factory does not use qualitative forecasting techniques poor marketing study and planning High downtime	11.54%	
2.	Aggregate production Planning	Poor Work motivation Poor Skill-up the workforce. Poor customer satisfaction High man powers turnover	7.7%	
3.	Masterproduction planning	Expensive sellingprices Poor Quality of Product Poor delivery date performance Production waste Poor sales performance Poor time utilization Actualmanufacturing costisnotproperly evaluated Poor customer satisfaction	17.31%	
4.	Materials requirementplanning	High downtime Poor communication Insufficient availability of raw materials	5.77%	
5.	Capacityplanning	Lowproductioncapacity utilization Poor time utilization Poor customer satisfaction The production plan does not meet the actual process Poor machine and equipment utilization Poor production performance High maintenance cost High energy cost • Capital shortage	61.54%	
Production control				
1.	Shop floorcontrol	The actual time spent on each procedure is not documented Poor communication	3.58%	
2.	Inventorycontrol	Does not Prepare EOQ (Economic Order Quantity) for each item Shortage of raw materials	3.58%	
3.	Manufacturing resource planning (MRPII)	The factory has a PPC division, but not well communicated and integrated with the other department/ division Does not use any application software	3.58%	
4.	JITmanufacturing	Not practiced in the company	-	
	General	The organization is trying to implement some of the practices of Aggregate production planning, Master production scheduling, and material requirements planning. Communication barrier between the top management level and its lower level	3.58%	

to investigate the problems' causes and their effects, see Figure 13.

The existing organizational structure of the company lacks integration of PPC with other departments this creates a great problem on the effectiveness of the company's PPC is as shown in Figure 14.

To address this problem, the Planning and Control Department needs to collaborate with most departments. It must coordinate with corporate planning for knowledge of planning objectives, material management, purchase schedules, and inventory levels, finance department for financial planning, budgeting, and cash flow requirements, personnel planning and recruitment, sales forecasts and the preparation of specifications and the selection of the best ones for implementation.

The identified problem must be the core problem of the company that is being investigated to generate logical and effective alternative solutions. In the end, priority should be given

to the study of weak capacity planning results. Without the provision of sufficient capacity or recognition of the presence of excess capacity, the advantages of an efficient PPC system cannot be realized. If the capacity given is inadequate, the organization can face declining delivery efficiency, growing work-in-progress inventories, and dissatisfied manufacturing staff who would quickly turn back to the informal system to solve problems. Capacity planning is therefore important to meet future demand by adjusting capacity to fluctuating demand. Therefore, capacity planning is devoted to developing the PPC model for an appropriate implementation of this research.

Table 2. Data analysis to prepare Pareto diagram.

#	PPC activities	80% Percentage	Cumulative %	Vital Few	Useful Many	Cut Off %
1	CP	61.54	53.70%	61.54		80%
2	MPS	17.31	68.80%	17.31		80%
3	DF	11.54	78.90%	11.54		80%
4	APP	7.7	85.60%	7.7		80%
5	MRP	5.78	90.60%		5.78	80%
6	SFC	3.58	93.80%		3.58	80%
7	IVC	3.58	96.90%		3.58	80%
8	MRPII	3.58	100.00%		3.58	80%

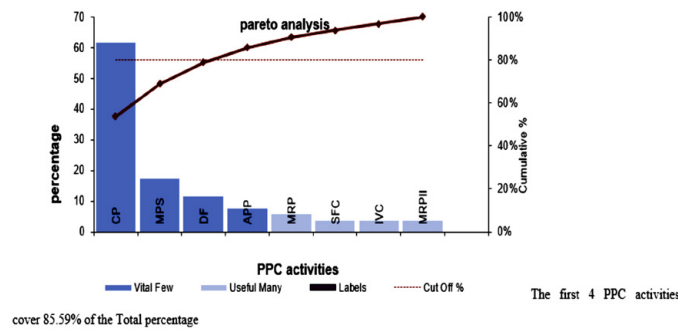


Figure 12. Pareto analyses to identify vital few PPC related problems.

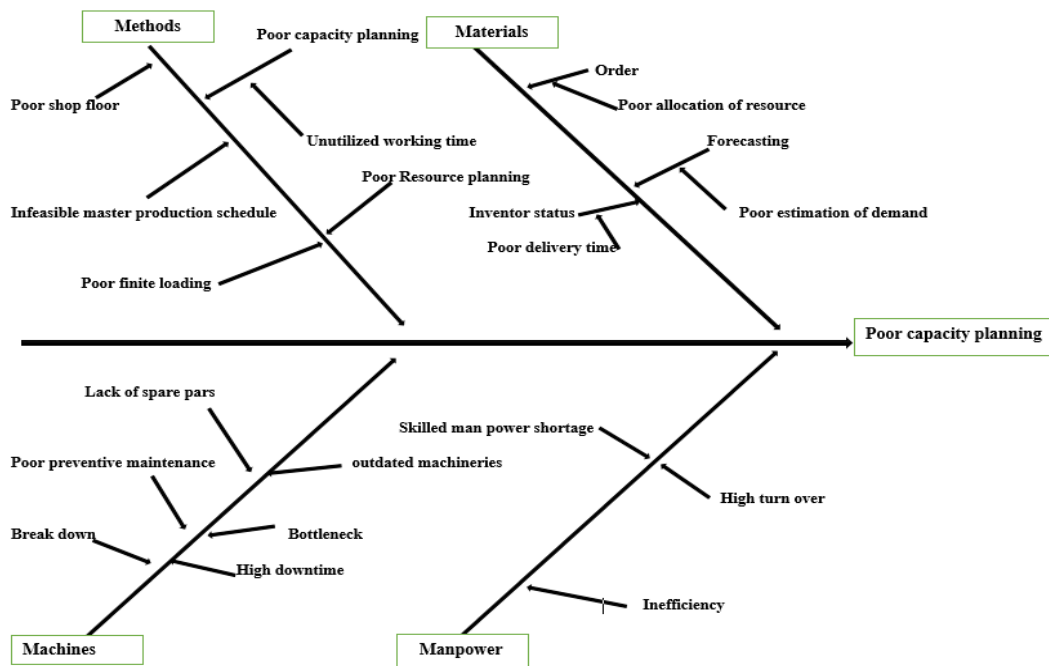


Figure 13. Cause and effect diagram.

Existing PPC evaluation

The existing company PPC framework performs some parts of the production planning and control activities, which are more or less performed aggregate production planning, material requirements planning and master production scheduling, while summarizing this, the company follows the conventional flow of production planning and control activities as shown in Figure 14.

Figure 15 depicts the developed model of PPC activities to overcome

shortfalls of capacity planning in existing which includes the Aggregate production plan (APP), Aggregate capacity plan (ACP), and Rough-cut capacity planning (RCCP).

Analyzing of ACP of the paper machine section

The production capacity of the white bond 60g/m² is 27443.9 ton/year as shown in Table 3 and the production requirement of the white bond 60g/m² is 21949.6 ton/year/machine from this data, the available capacity is greater

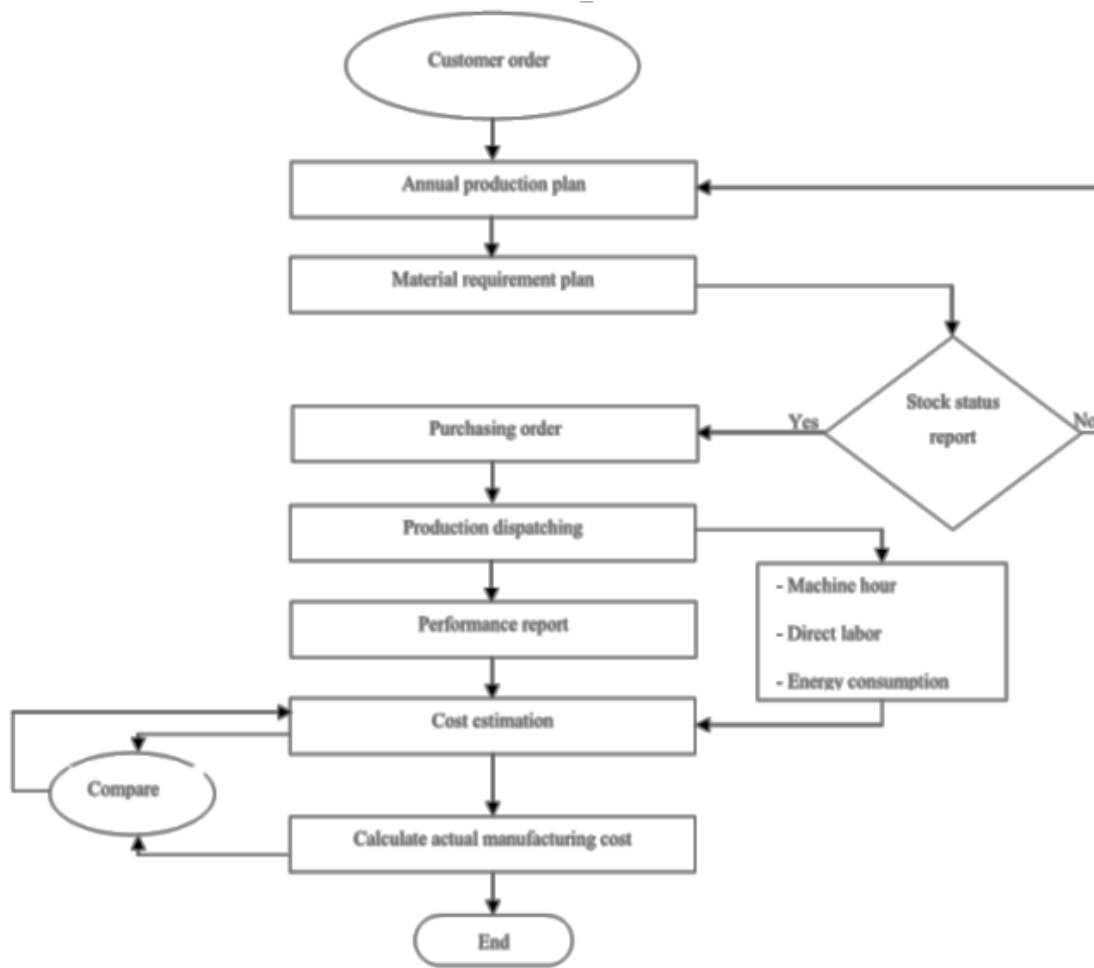


Figure 14. The existing PPC flow chart of the company.

Table 3. The ACPof the paper production section.

No	Type of machine	Quantity	Capacity (ton/hr)	Efficiency (%)	Production permonth (tons)	Production peryear (tons)	Operators required pershift
1	Paper machine	1	3.92	0.799	2286.99	27443.9	23

Table 4. RCCP of paper machine.

No	Type of machine	Quantity	Efficiency (%)	Paper grade	Speed (m/minute)	Production capacityper week(ton)	Production capacityper year(ton)
1	Paper machine	1	0.799	White Bond 60gm/m ²	150	571.75	27443.9

than the required capacity, making the APP feasible.

The total human resource requirement is 69 operators a day. Additional 10 operators are expected to cover the job during their annual leave. The section has a total of 85 operators, but the actual labor force requirement is 79. The available human resource is adequate to carry out the work according to the schedule.

Rough cut capacity planning (RCCP)

The rough-cut capacity planning aims to ensure that the master production schedule is feasible. For each product family, the average amount of work needed and the key work centers per unit can be calculated based on each item of the material bill and the production routing.

The paper machine process has a continuous process, from the hydraulic pulper to the calendar caliper, which is considered to be a key resource and

needs to be developed by the RCCP for the prepared MPS. The MPS for the paper machine is shown in Table 4.

The MPS of white bond 60 gm/m² is made to fully utilize the capacity of the paper machine. The available capacity recorded in the rough cut capacity planning can achieve the required white bond output of 60gm/m² following the master production schedule set out in Table 4.

As shown in Table 4, the available production capacity of white bond 60 gm/m² in the paper machine section is 27443.9 tons and the production requirement of white bond 60 gm/m² is 21949.6 ton/year/machine. The MPS is, therefore, feasible.

Analyzing resource plan capacity (RCP)

RCP inputs are MPS, MRP, inventory status reports, and product structure records—Material billing (BOM). (BOM). The company's material requirement

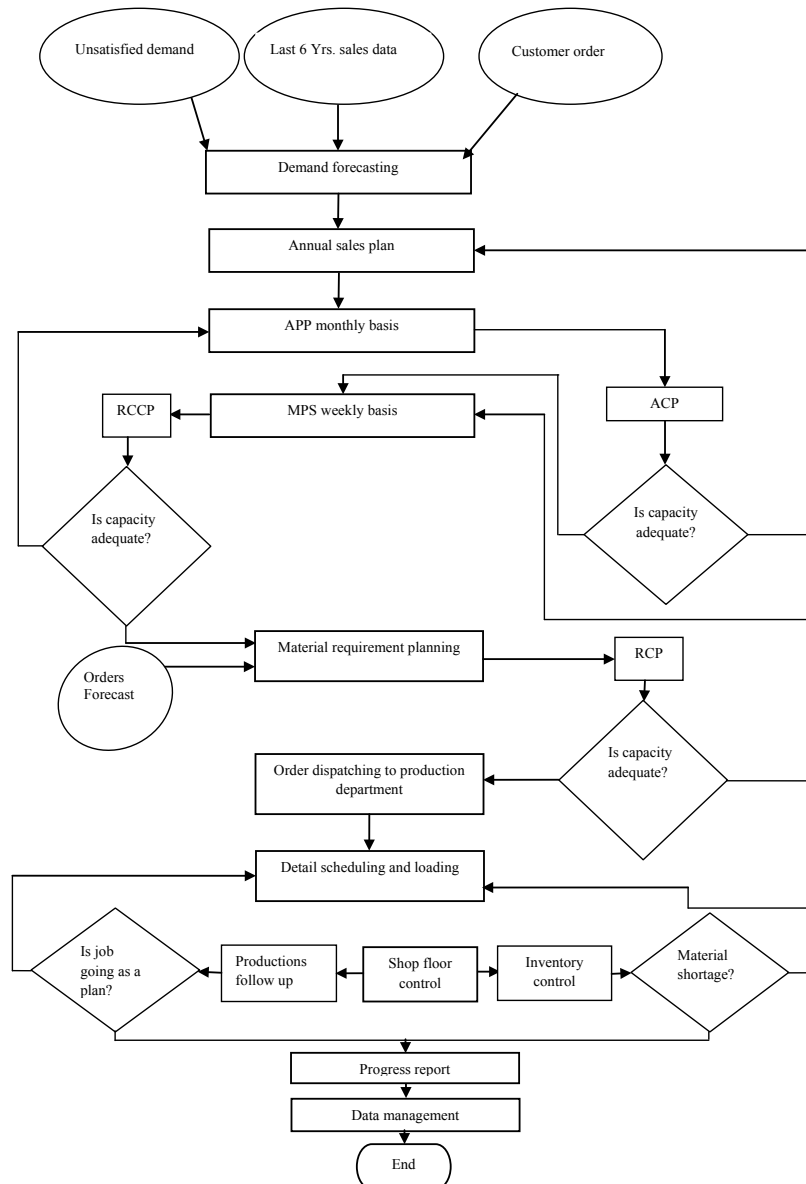


Figure 15. Developed PPC Model.

plan was made in gross for annual consumption. Most of the schedule shown is not feasible, because of formality. The MRP carried out on this paper will help to maintain the material flow in the production process of the company by referring to what type of material, in what quantity, and at what time each section will be required, and will also reduce the downtime of the machine by avoiding the shortage of raw material in each section. Also, the MRP prepared here determines the size of the lot by calculating the quantity of the economic order to make the ordering costs and the balance of the costs.

Conclusion

There is a significant gap between the existing skilled workforce and the standard qualification framework. The main causes of this problem are the shortage of local paper technology graduates. Data shows that the efficiency of workers is less than the expected value directly related to the high cost of output, which contributes to a high selling price, and thus the business becomes incompetent on the market. The key causes of the issue are lack of experience, lack of willingness, and wage dissatisfaction.

The turnover of the workforce increased from year to year. High turnover has a direct relationship with low productivity, poor product quality, and high production costs due to the loss of experienced workers and additional costs

for hiring and training new employees. Wage structure and poor human resource management performance are the main causes of this problem. The company does not prepare a rough-cut capacity plan. This led the company to have an unfeasible MPS and bottle neck.

The unfeasible master production schedule leads the company to face problems such as the failure to keep the promise of delivery to the customer, the poor utilization of the plant, and the failure to achieve the production plan. The main causes of this problem are the lack of a method to check the feasibility of the Master Production Schedule, the rough cut-off planning of the capacity.

The existing PPC lacks aggregate capacity planning (ACP) as a result of which the company has an unfeasible aggregate production plan (APP), which results in poor capacity utilization, failure to maintain inventories, job instability, low productivity, poor delivery date estimation, customer dissatisfaction, high production time, poor product quality and high downtime.

The lack of resource capacity planning in the existing PPC can be detected by the incapability of MRP, which has a high Inventory Level, Component Shortages, poor productivity, poor scheduling, unoptimized purchase and production costs, increased lead time, and poor communication results in poor equipment and working time utilization.

To solve MRP related problems the company should properly check its MRP using the appropriate resource capacity planning (RCP) method, answer the following three questions: what is needed; how much is needed; and when it is needed and cross-check the results with MRP.

The existing company PPC lacks a finite loading analysis, which can be detected by poor shop floor control, production schedules, and company capacity estimation.

Due to existing poor shop floor control activities, the company may be faced with problems such as high WIP quantity, unable to provide actual output data for capacity control purposes, and unable to measure the efficiency of manpower and machines.

The lack of input-output analysis in the company can be seen by the poor monitoring and control of the company's capacity plans. As a result, the company faced challenges such as not being able to meet future demand by adjusting capacity to fluctuating demand, maximizing initial costs, and reducing competitiveness. The main causes of this problem are poor monitoring and control of the company's capacity plans.

The lack of adequate and up-to-date information on inventory status, demand forecasting, shop routing, orders, and material bill (BOM), and work center status are among the problems identified. As a result, the company experienced high production lead time, overloading of labor, poor product quality, shortage of rawmaterial, a long queue of orders, poor resource allocation, order of production, poor machine utilization, and a high WIP inventory.

Shortage and high cost of pulp and chemicals, poor quality of the broken paper and water treatment, and high energy costs are some of the problems of supply. These problems contribute to the company's poor delivery date, high price, poor product quality, and high cost of production.

The other reason for the high cost of production of the company is due to high maintenance costs due to the frequent breakdown of machines and the existing outdated machinery and equipment.

Recommendations

The following recommendations are collected from this study:

- The company should train, work with local institutions to include paper technology in their curriculum, or open a program. It is strictly recommended that the company strengthen its skilled workforce in the field of paper technology. Motivate workers by using different techniques, such as incentives, promotion, and reform of the salary scale, without affecting the company's production cost plan.
- It is strictly recommended that the company improve the efficiency of its employees by applying appropriate control and monitoring mechanisms for efficiency. Satisfy its workers and improve human resource management activities by communicating and responding quickly to a worker's complaint. Check the feasibility of their MPS by including the RCCP in their PPC activities as indicated in the newly developed model. But also implement well-planned and scheduled preventive maintenance to minimize the existence of bottleneck machinery in the production line.
- Always check the feasibility of their APP by applying the appropriate feasibility assessment method, ACP, as indicated on the newly developed model. To make their MRP effective, it is important to identify the required input materials and desired outputs and to check their feasibility using RCP.
- To improve the equipment and the utilization of working time, the company should be able to predetermine the necessary equipment, the detailed working time of the machine, and the hours of labor required for production. To solve poor shop floor control problems related to the company, the three basic steps for effective SFCs should be followed, such as the correct procedures

and communication of order releases, order scheduling, and order progress.

- To solve poor monitoring and control of the related problems of the company's capacity plans, the capacity should always be adapted to fluctuating demand.
- The company should update the inventory status regularly and calculate the EOQ for each item.
- Updating and disseminating customer order information, unsatisfied demand, and previous year sales data, work center status, performance data, route sheet, BOM to all production planning and control personnel and other personnel concerned. Use sub-contractual agreements with local factories, practice sorting mechanisms for broken paper, and use cheap water treatment techniques such as deep sedimentation. This will minimize supply-related issues.
- To minimize the company's high energy costs, the company should minimize the production life cycle by properly scheduling the resources, machinery, and labor and using the available recycled paper. Properly plan and implement preventive maintenance and management should strive to replace outdated machinery and equipment, step by step, which will eliminate these problems in the long run.

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