SOLVING PROBLEMS FACED BY RASTOGI MOTORS

Final submission for the BDM capstone Project

Submitted by

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EXECUTIVE SUMMARY

The final submission of the project report, which focuses on resolving inventory management and workforce management problems within a garage. The report includes three months' worth of data collection and analysis. Excel tools were used to identify and address the identified issues.

The primary objective of this project was to identify and solve challenges related to inventory management and workforce optimization. Through an in-depth analysis of the collected data, various issues affecting the garage's operations were identified, including inefficient inventory management practices and workforce utilization. For inventory management, various techniques were utilized, including data visualization, demand forecasting, and optimized reorder point calculations. These tools helped the garage improve inventory control, reduce costs, and minimize stockouts.

In terms of workforce management, the analysis identified issues such as inefficient shift scheduling, improper resource allocation, and a lack of performance tracking mechanisms. Various tools were used allocate resources effectively, and implement performance tracking systems. As a result, the garage experienced increased productivity, improved employee satisfaction, and better utilization of available workforce.

In conclusion, the whole project successfully addresses the inventory and workforce management challenges faced by the garage. By using Excel tools and a data-driven approach, identifying, analyzing, and resolving the underlying issues concerned with garage were solved.

Results/Recommendations are presented that will help the garage and will eventually increase the productivity of *RASTOGI MOTORS*.

ANALYSIS PROCESS/METHOD

INVENTORY MANAGEMENT PROBLEM

SOLVING APPROACH

1)Stockout Analysis:

- ❑ The closing balance column is analyzed to identify occurrences of stockouts.
- ❑ Stockouts are recognized when the closing balance reaches zero or falls below a predefined threshold.
- ❑ Analyzing the closing balance helps in understanding when and how often stockouts are happening.

Formula to Identify Stockouts:

- ❑ A formula can be used to automate the identification of stockouts based on the closing balance.
- ❑ The formula "IF (E2 <= 0, 'Stockout', ")" can be applied to check if the closing balance in cell E2 is less than or equal to zero.
- ❑ The formula outputs the term "Stockout" when a stockout is detected in the dataset.

EXPLANATION OF APPROACH:

The closing balance serves as a vital indicator of the precise inventory level at the conclusion of a designated period, commonly on a monthly or quarterly basis. It enables the garage to maintain a continuous awareness of their stock status in real-time. By monitoring the closing balance, the garage can effectively know the quantitative measurement of its stock levels, ensuring a clear understanding of available inventory.

By establishing a predefined threshold, such as zero, the garage can establish a well-defined benchmark for identifying stockouts. This proactive approach allows the garage to promptly detect instances where stock levels have fallen below the established threshold. This valuable information, the garage can take immediate action to replenish stock, minimizing any adverse effects on customer satisfaction and revenue generation. By closely monitoring the closing balance and promptly addressing stockouts, the garage can maintain a consistent availability of products to meet customer demands.

This strategy ensures that customers can rely on the garage to provide the products they need, leading to enhanced customer satisfaction and loyalty. By avoiding stockouts, the garage can capture sales that might have otherwise been lost due to unavailability of products. This proactive approach positively impacts the bottom line and contributes to sustained revenue growth.

2) Inventory Replenishment:

An inventory management system will be created that tracks stock levels and generates reorder points based on demand forecasts, as well as calculates safety stock levels: -

1. Calculate the Average Monthly Demand To calculate the average monthly demand. **(Formula used: = (Closing Balance - Opening Balance + Inwards – Outwards) / 3)**

2. Reorder Point Calculation: -The reorder point is the inventory level at which a new order should be placed to replenish stock.
   (Formula used=Average Monthly Demand * Lead Time)

3. Safety Stock Level Calculation: -The safety stock level is an additional buffer of inventory maintained to account for uncertain demand and lead time variability.
   (Formula used =MAX (0, Average Monthly Demand * (Lead Time - 1) - (Closing Balance – Reorder Point)) This formula ensures that enough extra stock is available to cover any unexpected fluctuations in demand or lead time.

EXPLANATION OF APPROACH:

The approach of calculating the average monthly demand, reorder point, and safety stock level brings numerous benefits that contribute to effective inventory management. Firstly, by accurately determining the average monthly demand, comprehensive insights into the typical consumption patterns of products will be gained.

The calculation of the reorder point is a crucial aspect of this approach. This helps to determine the inventory level at which a new order should be placed. A smooth and continuous flow of inventory will be maintained as it ensures timely replenishment before stocks deplete. Consequently, costly stockouts will be prevented. Moreover, the safety stock level calculation further enhances inventory management practices

By considering the uncertainties associated with both demand and lead time variability, the safety stock acts as a buffer to mitigate the risks of unexpected fluctuations. It provides an additional layer of protection against unforeseen circumstances, such as sudden increases in demand or delays in the supply chain. The formula used to calculate the safety stock level ensures that sufficient extra stock is available to cover these fluctuations, thereby enhancing ability to meet customer needs without compromising on service levels.

Implementing this approach offers several benefits. Efficient inventory planning based on average monthly demand enables to strike a balance between carrying costs and meeting customer demand, optimizing working capital and reducing the risk of excess inventory. The inclusion of safety stock levels safeguards against uncertainties, providing a safety net that protects against unforeseen events and helps maintain a reliable supply of goods. Ultimately, this approach allows for smoother operations, cost savings, improved customer service, and better overall control over inventory management processes.

WORKFORCE MANAGEMENT PROBLEM

SOLVING APPROACH

OPTIMIZING WORKFORCE:

To optimize the workforce management and maximize output while minimizing the number of workers, three months of workforce data is analyzed and inferences are drawn from it.

1) Calculating the total cost and total tasks for each staff.
2) Total cost for each month by summing the Permanent Staff Cost and hired Staff Cost.
3) Total tasks for each month by multiplying the average tasks per day by the number of working days in that month.
4) Calculated the average tasks per worker for each month by dividing the total tasks by the total number of staff members (permanent and hired).
5) Calculated the cost per task for each month by dividing the Total Cost by the Total Tasks.
6) Identify the months with the highest average tasks per worker and the lowest cost per task. These months represent the most efficient utilization of the workforce.

7) Evaluate the months with lower efficiency and identify any potential causes (e.g., high workforce availability, low demand etc.).

8) Based on these observations, adjustments to the workforce allocation will be made and scheduling to optimize productivity while minimizing costs.

EXPLANATION OF APPROACH:

This approach offers several benefits to the garage in terms of cost optimization, workforce efficiency, resource allocation, performance evaluation, financial planning, and continuous improvement.

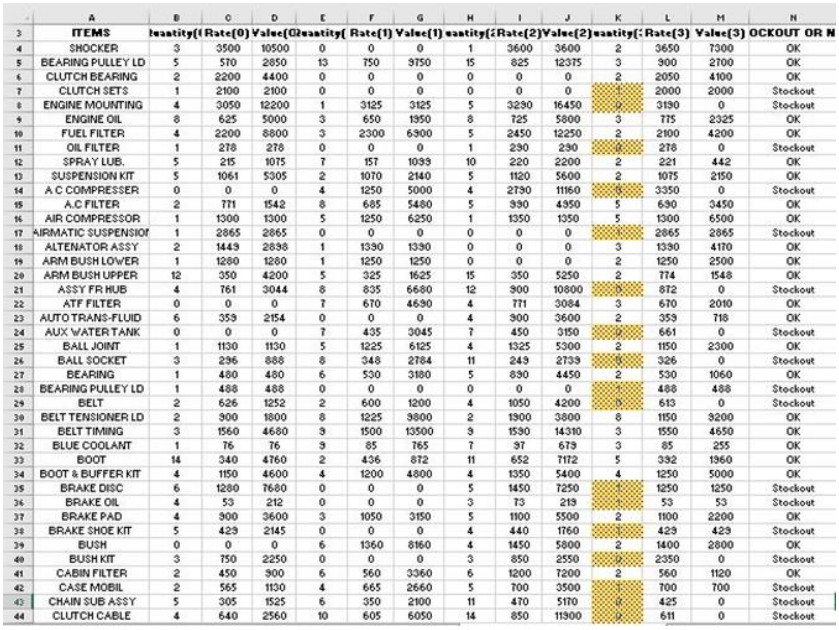
Firstly, the approach enables cost optimization by accurately calculating total costs and identifying the cost per task. This allows the garage to identify areas of inefficiency and make informed decisions to minimize expenses. By understanding the cost breakdown, the garage can identify opportunities to reduce costs and optimize processes to improve cost-effectiveness. Secondly, the approach focuses on workforce efficiency by analyzing total tasks and average tasks per worker. By identifying months with high average tasks per worker, the garage can allocate resources effectively, ensuring that tasks are completed efficiently. This optimization of workforce allocation leads to improved productivity and reduces the risk of employee burnout.

Moreover, the approach aids in resource allocation, allowing the garage to assign tasks and allocate skills in a more effective manner. By understanding individual contributions and workload distribution, the garage can make informed decisions to optimize operations and maximize resource utilization. This ensures that the right skills are deployed to the right tasks, improving overall efficiency and customer satisfaction.

The approach also supports performance evaluation by calculating total tasks and costs for each staff member Furthermore, the approach assists in financial planning and budgeting by providing a clear overview of monthly costs. The garage can use this information to forecast future expenses accurately, set realistic budget targets, and make informed financial decisions.

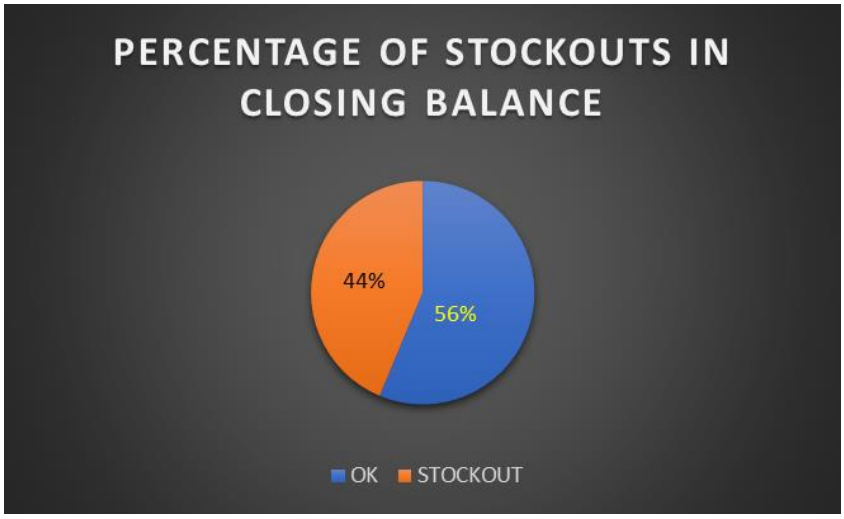
RESULTS AND FINDINGS

INVENTORY MANAGEMENT PROBLEM

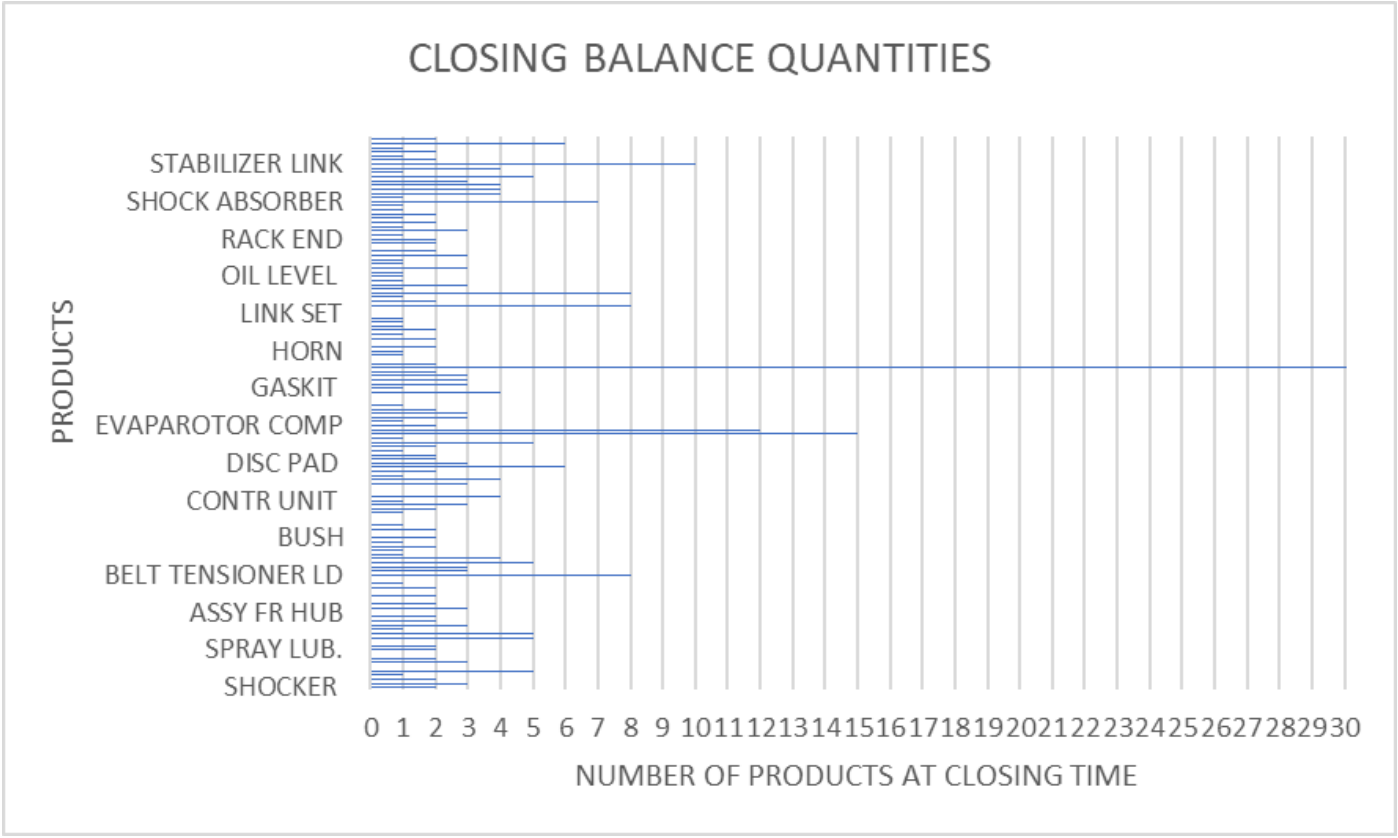


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
3	ITEMS	uantity(1	Rate(0)	Value(0	uantity(	Rate(1)	Value(1)	uantity(2	Rate(2)	Value(2)	uantity(3	Rate(3)	Value(3)	OCKOUT OR N
4	SHOCKER	3	3500	10500	0	0	0	1	3600	3600	2	3650	7300	OK
5	BEARING PULLEY LD	5	570	2850	13	750	9750	15	825	12375	3	900	2700	OK
6	CLUTCH BEARING	2	2200	4400	0	0	0	0	0	0	2	2050	4100	OK
7	CLUTCH SETS	1	2100	2100	0	0	0	0	0	0	1	2000	2000	Stockout
8	ENGINE MOUNTING	4	3050	12200	1	3125	3125	5	3290	16450	0	3190	0	Stockout
9	ENGINE OIL	8	625	5000	3	650	1950	8	725	5800	3	775	2325	OK
10	FUEL FILTER	4	2200	8800	3	2300	6900	5	2450	12250	2	2100	4200	OK
11	OIL FILTER	1	278	278	0	0	0	1	290	290	0	278	0	Stockout
12	SPRAY LUB.	5	215	1075	7	157	1099	10	220	2200	2	221	442	OK
13	SUSPENSION KIT	5	1061	5305	2	1070	2140	5	1120	5600	2	1075	2150	OK
14	A.C COMPRESSER	0	0	0	4	1250	5000	4	2790	11160	0	3350	0	Stockout
15	A.C FILTER	2	771	1542	8	685	5480	5	930	4350	5	690	3450	OK
16	AIR COMPRESSOR	1	1300	1300	5	1250	6250	1	1350	1350	5	1300	6500	OK
17	AIRMATIC SUSPENSIOI	1	2865	2865	0	0	0	0	0	0	1	2865	2865	Stockout
18	ALTENATOR ASSY	2	1449	2898	1	1390	1390	0	0	0	3	1390	4170	OK
19	ARM BUSH LOWER	1	1280	1280	1	1250	1250	0	0	0	2	1250	2500	OK
20	ARM BUSH UPPER	12	350	4200	5	325	1625	15	350	5250	2	774	1548	OK
21	ASSY FR HUB	4	761	3044	8	835	6680	12	900	10800	0	872	0	Stockout
22	ATF FILTER	0	0	0	7	670	4690	4	771	3084	3	670	2010	OK
23	AUTO TRANS-FLUID	6	359	2154	0	0	0	4	900	3600	2	359	718	OK
24	AUX WATER TANK	0	0	0	7	435	3045	7	450	3150	0	661	0	Stockout
25	BALL JOINT	1	1130	1130	5	1225	6125	4	1325	5300	2	1150	2300	OK
26	BALL SOCKET	3	296	888	8	348	2784	11	249	2739	0	326	0	Stockout
27	BEARING	1	480	480	6	530	3180	5	890	4450	2	530	1060	OK
28	BEARING PULLEY LD	1	488	488	0	0	0	0	0	0	1	488	488	Stockout
29	BELT	2	626	1252	2	600	1200	4	1050	4200	0	613	0	Stockout
30	BELT TENSIONER LD	2	900	1800	8	1225	9800	2	1900	3800	8	1150	9200	OK
31	BELT TIMING	3	1560	4680	9	1500	13500	9	1530	14310	3	1550	4650	OK
32	BLUE COOLANT	1	76	76	9	85	765	7	97	679	3	85	255	OK
33	BOOT	14	340	4760	2	436	872	11	652	7172	5	392	1960	OK
34	BOOT & BUFFER KIT	4	1150	4600	4	1200	4800	4	1350	5400	4	1250	5000	OK
35	BRAKE DISC	6	1280	7680	0	0	0	5	1450	7250	1	1250	1250	Stockout
36	BRAKE OIL	4	53	212	0	0	0	3	73	219	1	53	53	Stockout
37	BRAKE PAD	4	900	3600	3	1050	3150	5	1100	5500	2	1100	2200	OK
38	BRAKE SHOE KIT	5	429	2145	0	0	0	4	440	1760	1	429	429	Stockout
39	BUSH	0	0	0	6	1360	8160	4	1450	5800	2	1400	2800	OK
40	BUSH KIT	3	750	2250	0	0	0	3	850	2550	0	2350	0	Stockout
41	CABIN FILTER	2	450	900	6	560	3360	6	1200	7200	2	560	1120	OK
42	CASE MOBIL	2	565	1130	4	665	2660	5	700	3500	1	700	700	Stockout
43	CHAIN SUB ASSY	5	305	1525	6	350	2100	11	470	5170	0	425	0	Stockout
44	CLUTCH CABLE	4	640	2560	10	605	6050	14	850	11900	0	611	0	Stockout

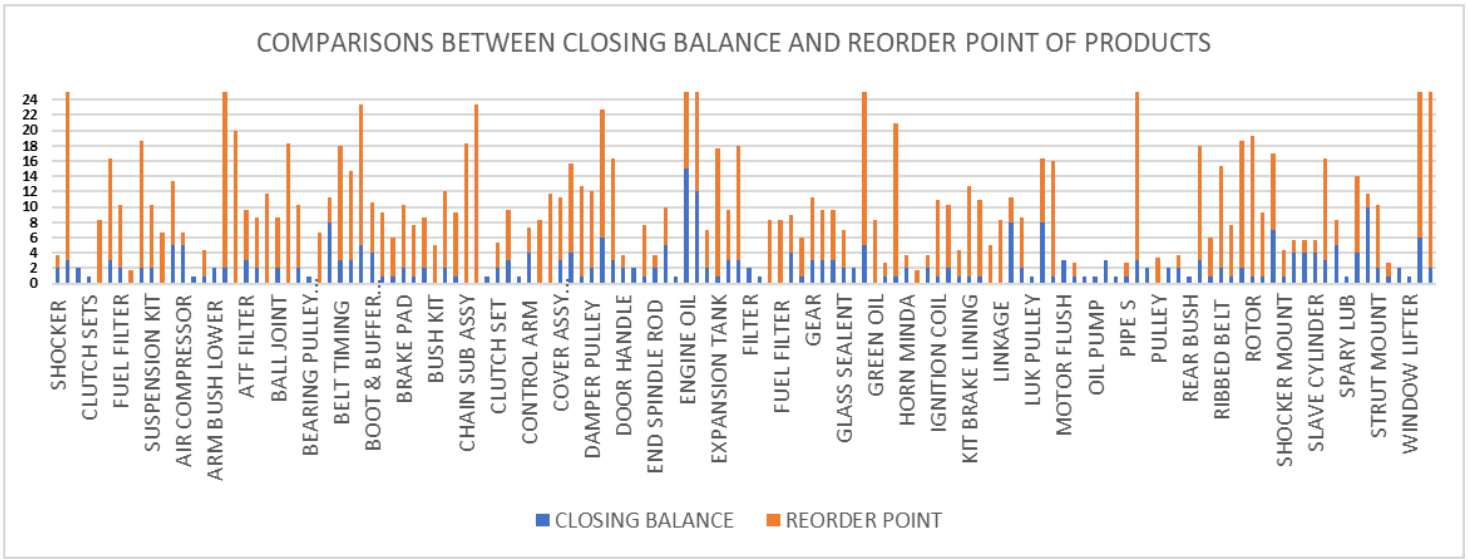
Conditional formatting of the closing balance was done to visually show the stockouts.



(“IF (E2 <= 1, "Stockout")”.) was used to calculate the stockouts and is demonstrated with percentages. Pie chart here depicts stockout percentage of the total products available at garage.



Bar chart to represent the closing balance of the products in garage. This provides the visuals of the quantities of various products left.

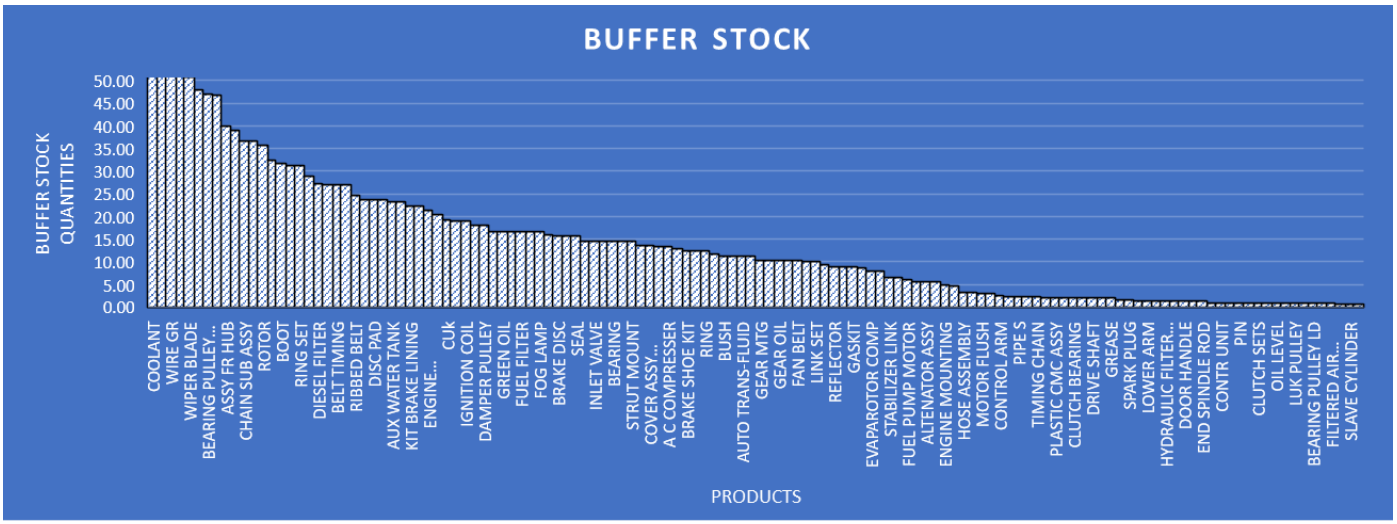


Reorder Point Calculation: -The reorder point is the inventory level at which a new order should be placed to replenish stock.

(Formula used=Average Monthly Demand * Lead Time)

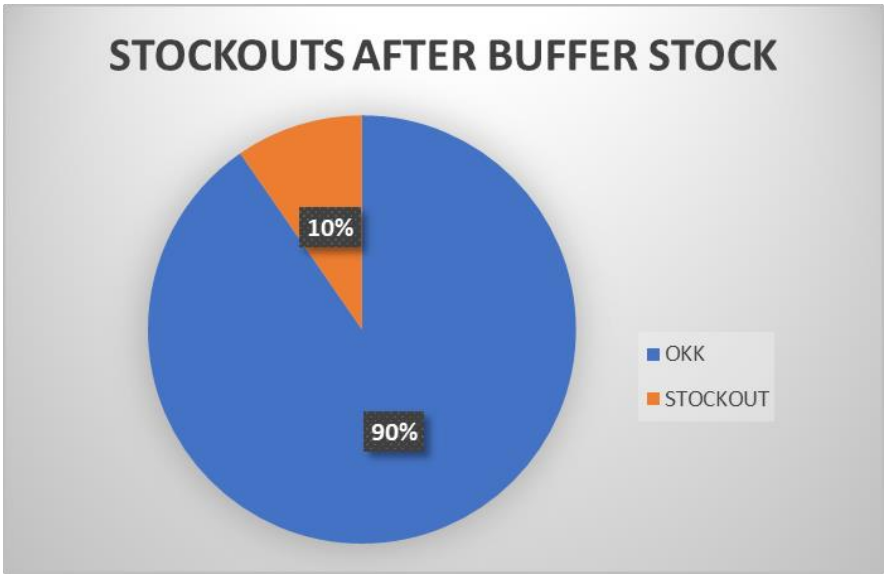
In the bar chart above it is clearly visible that the reorder points of most of the products is high.

A gap between the reorder point and the closing balance suggests that inventory experiences variability in demand or lead time. This gives need to maintain a buffer to mitigate the risks of stockouts.



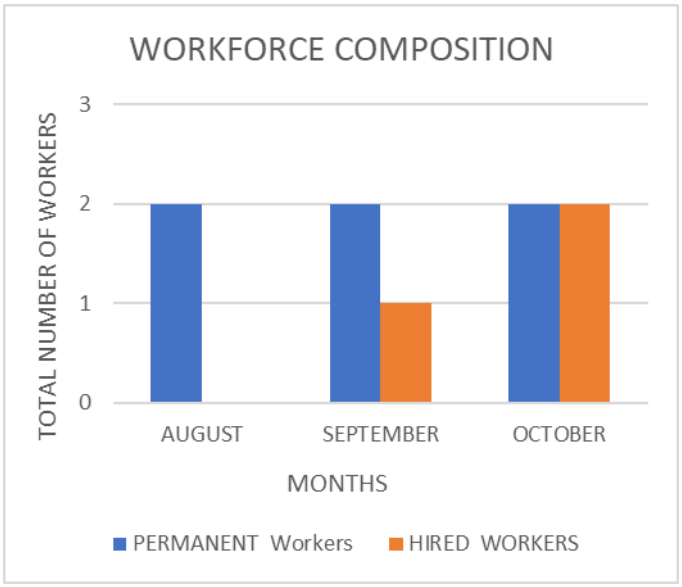
After the reorder point calculation, the buffer stock is calculated. Buffer stock helps like a cushion for unpredicted demands.

Buffer Stock = Reorder Point - Closing Balance + (Average Daily Demand × Lead Time)

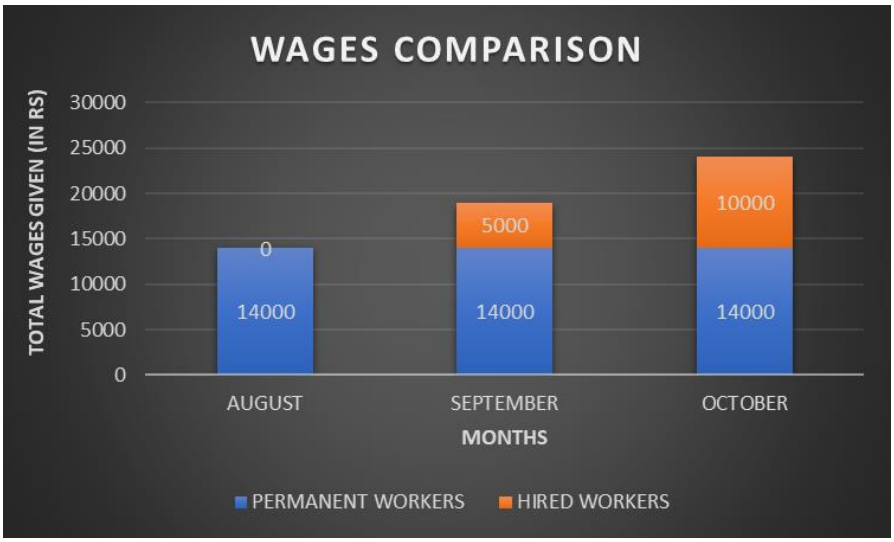


With buffer stock in hand conditional formatting is applied again. A pie chart is made to visually show the stockout percentages after the changes.

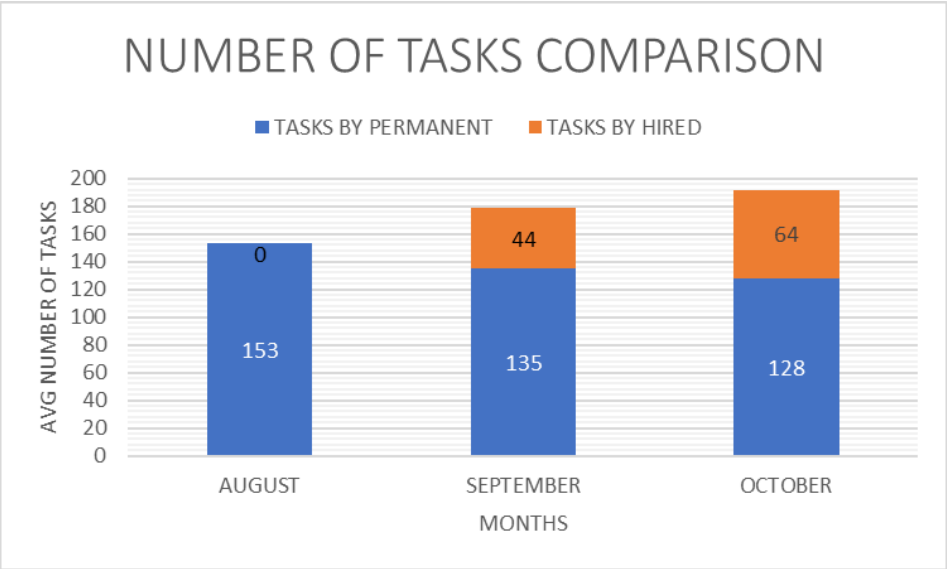
WORKFORCE MANAGEMENT PROBLEM



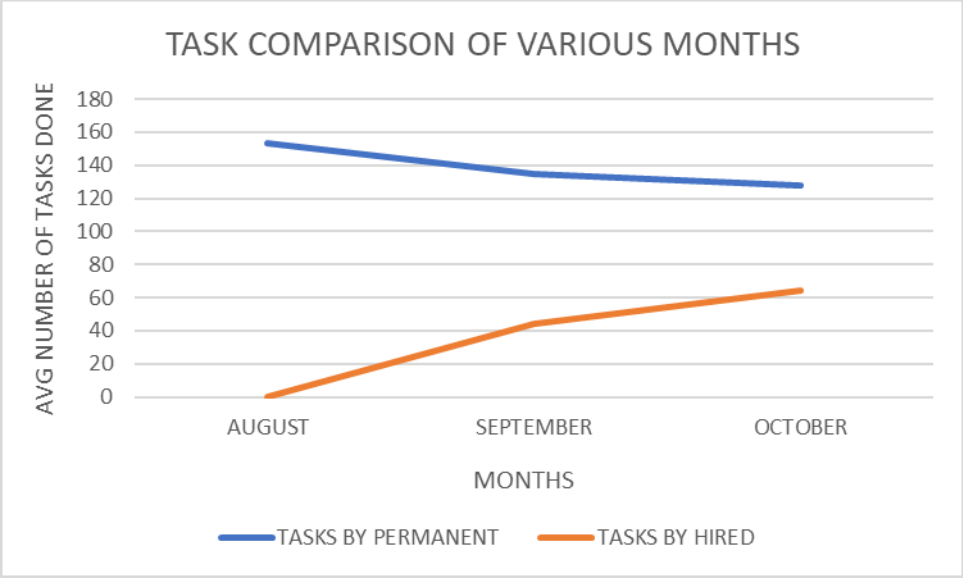
3 months workforce composition of the garage. There are 2 permanent workers plus 1 hired worker in month of September and 2 extra workers were hired in the month of October.



After workforce composition there is wages given by the owner to his workers. Permanent workers are given Rs 7000 each and hired workers are given Rs 5000 each. Bar chart above shows the total amount spent in each month.

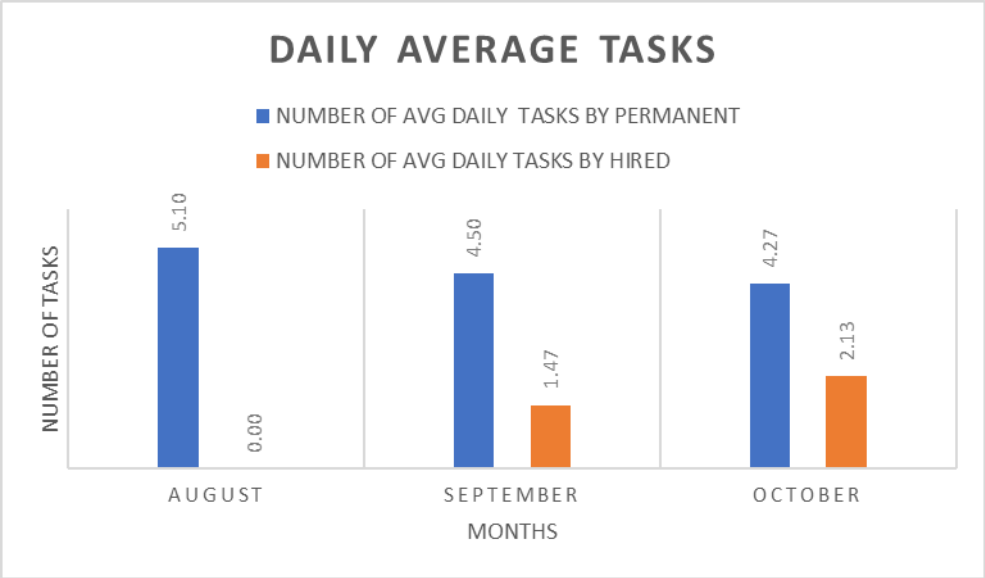


Average number of tasks done by hired vs the permanent workers is showed in the bar chart. This is calculated so that the reason why extra hired help was needed can be determined.



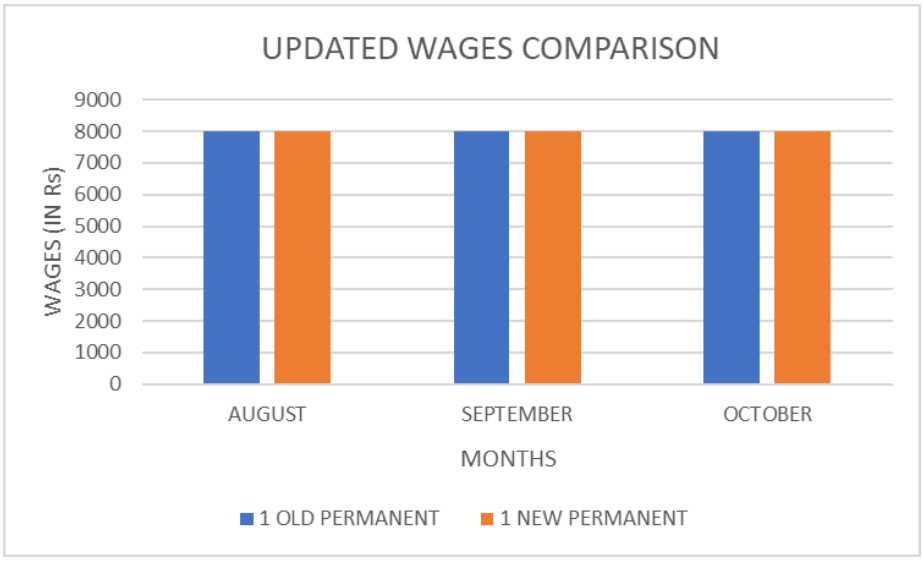
Line chart is made of the average number of tasks done by hired and permanent workers to show month wise comparisons.

Line chart clearly shows that there is the dip in the number of tasks done by permanent workers in the month of September and month of October when extra workers were hired.



To further prove the dip in the monthly average of number of tasks done by permanent workers, daily average is calculated and then comparison is done.

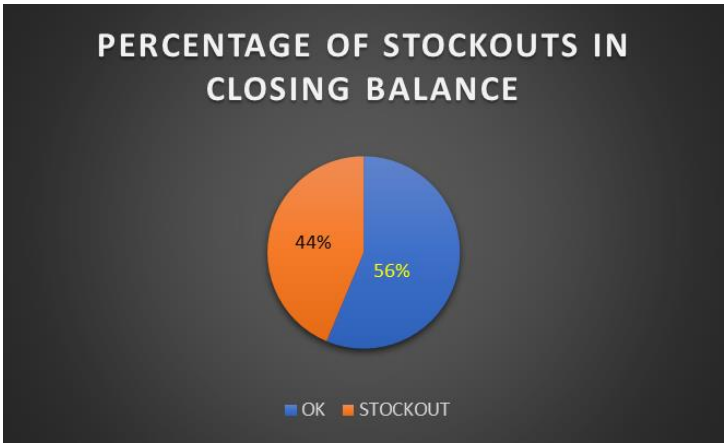
Bar chart here clearly shows depicts the decrease in work done by permanent workers.



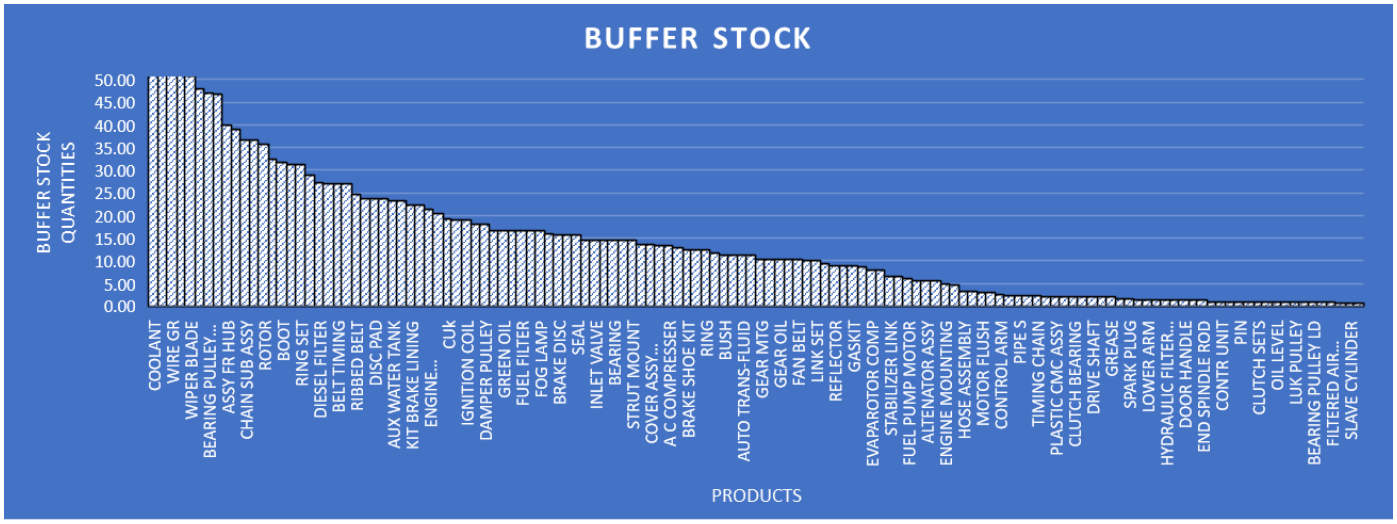
One of the permanent workers is fired and skilled worker is hired and both are given a raise. As the bar chart shows both will be given the same amount of money to avoid workplace envy. Also, it will decrease the total amount of wages.

INTERPRETATION OF RESULTS

INVENTORY MANAGEMENT PROBLEM

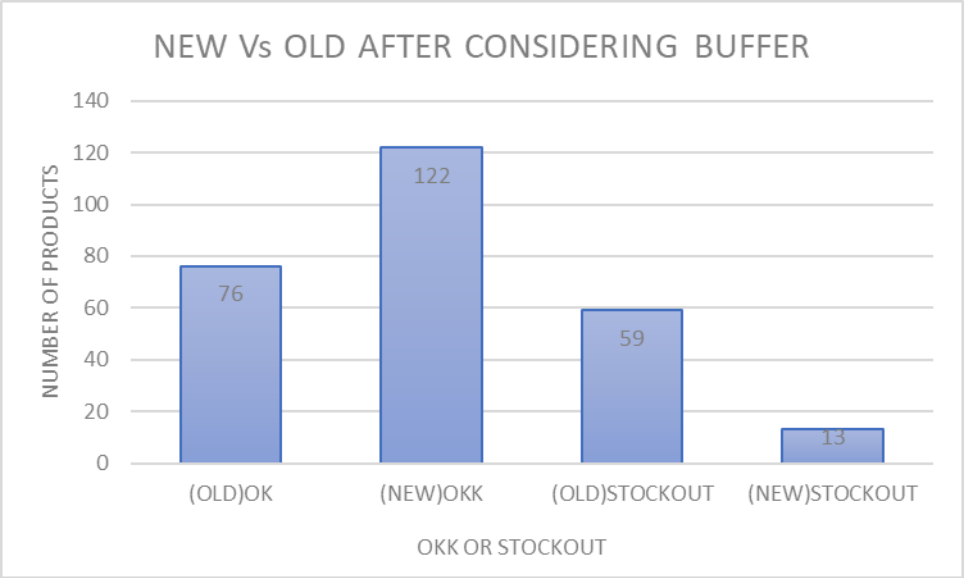


The stockout problem can be clearly seen from this pie chart. Garage is running out of products before the restocking. Conditional formatting was done to calculate this.

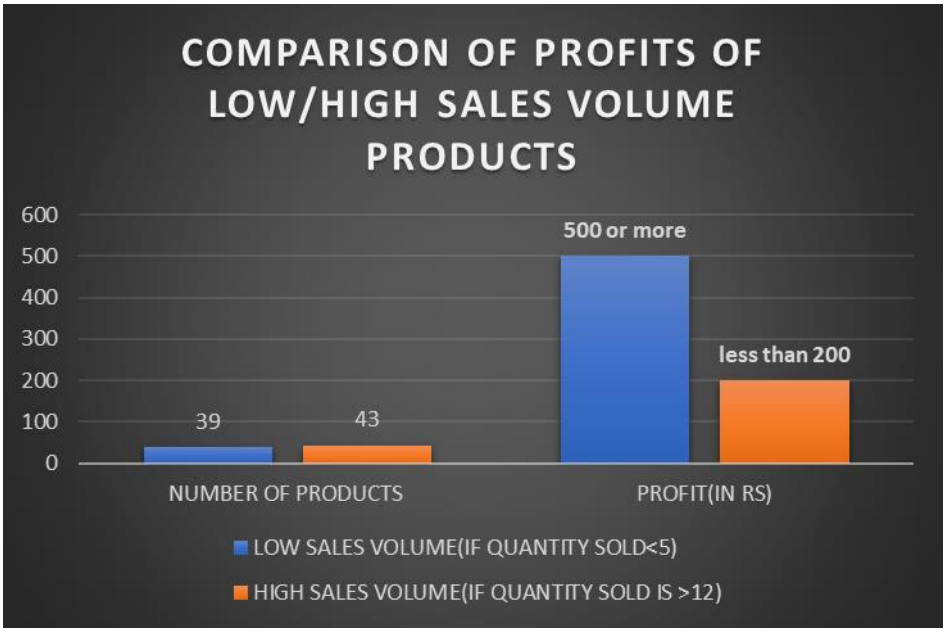


After the reorder point calculation, the buffer stock is calculated. Buffer stock helps like a cushion for unpredicted demands.

After the buffer stock calculation, the conditional formatting is done again. This time the stockouts percentages was very low and a bar chart is made to show the comparisons between old and the new quantities.



After the buffer stock calculation, the conditional formatting is done again. This time the stockouts percentages was very low and the bar chart made shows the comparisons between old and the new quantities. With the addition of buffer, the stockouts drop around 30% and are currently at only around 9-10%.

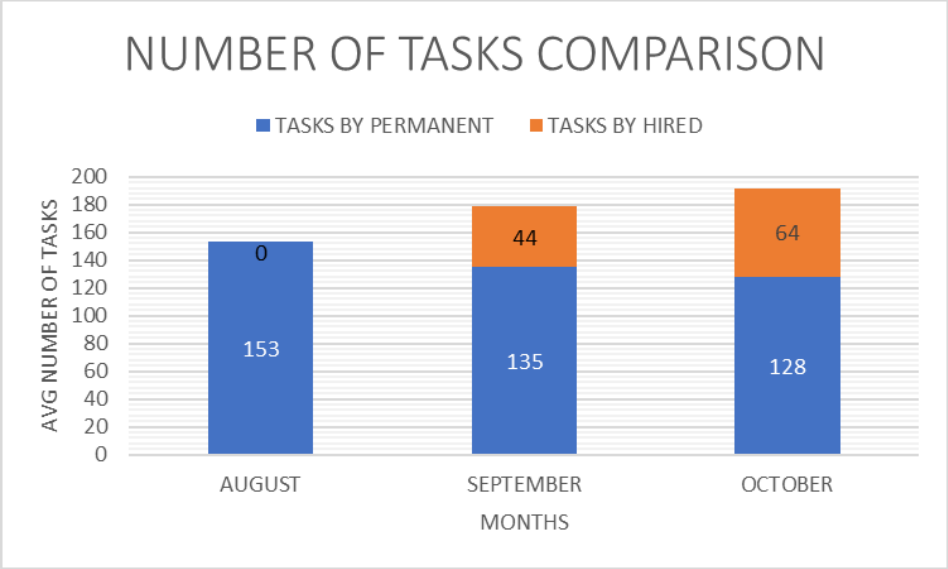


A pattern was observed between the sales and the quantities of products sold by the garage. It was observed that some products were sold less in number but gives higher profits.

In contrast certain products with even higher sales volume yield out low profits.

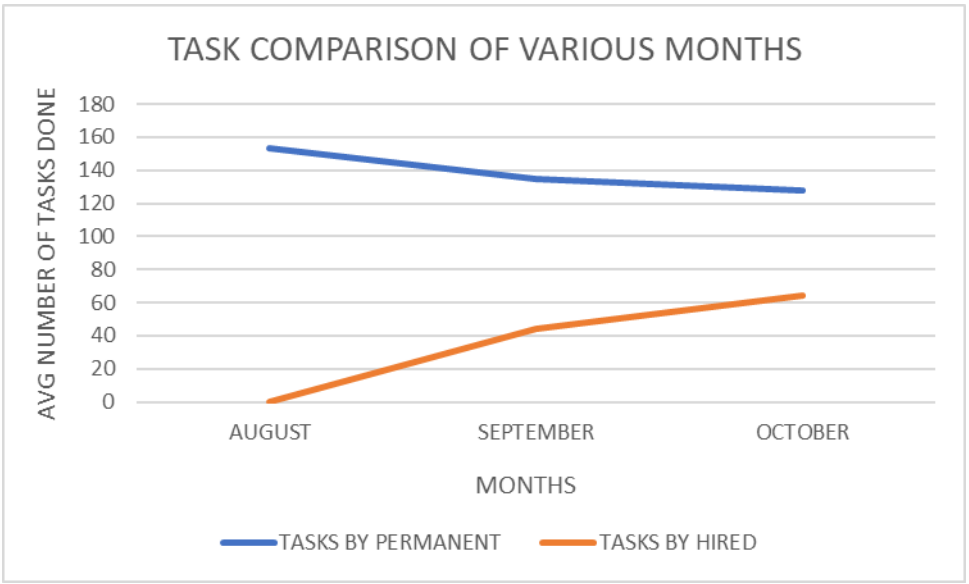
(If profits>500 = HIGH profit , If profits<200 =LOW profit)

WORKFORCE MANAGEMENT PROBLEM

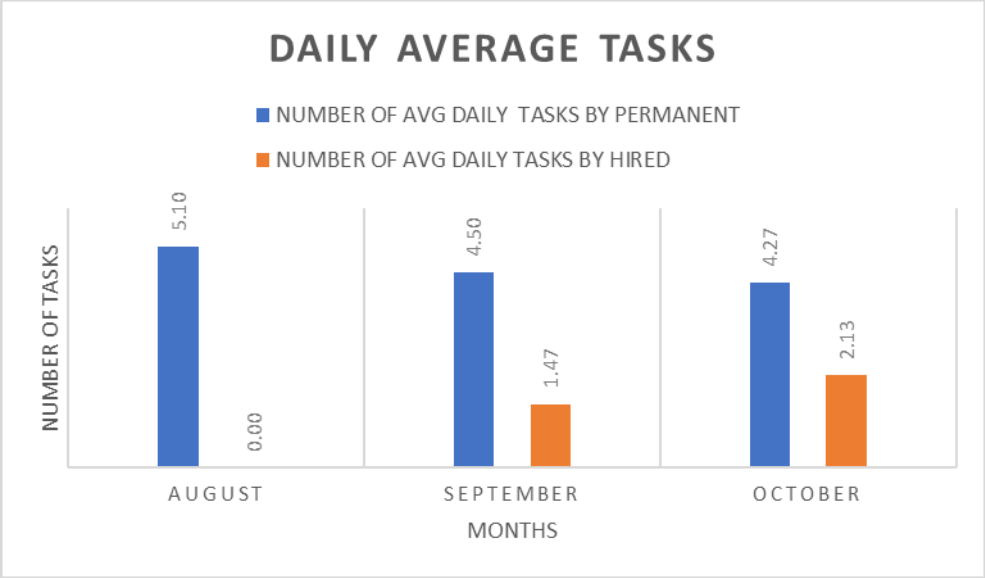


The bar chart shows the average number of tasks done in various months by hired plus permanent workers.

August average was 153 tasks done by 2 permanent workers. In September 1 extra worker was hired and average of the permanent workers fell. In month of October the average of permanent workers further fell.

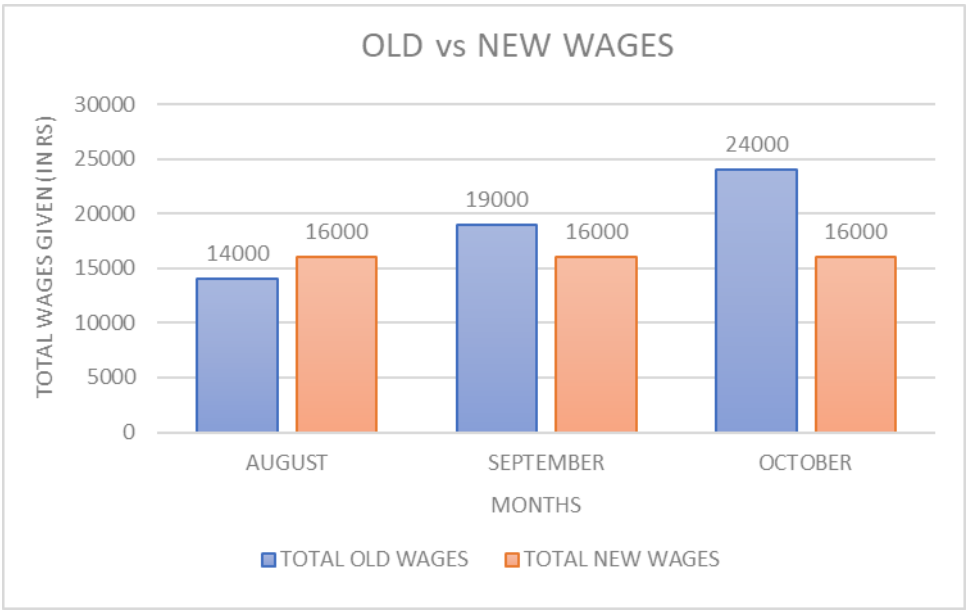


Line chart here visualize the fall in monthly average of the tasks done by 2 permanent workers as the extra help is hired. Daily average will provide further insights.



Number of works done per day by workers is calculated in each month. This clearly shows the decrease in the number of tasks done by permanent workers in month of SEPTEMBER and OCTOBER.

This discovery was shared with the owner and according to him the hiring of extra workers was not always directly related to the total number of works coming to the garage.(This was discovered by bar chart showing the falling of number of tasks done by permanent workers.) Extra help was needed to do certain more skillful tasks which the permanent workers are not able to perform due to lack of skills.



One of the permanent workers is fired and skilled worker is hired and both are given a raise. As the bar chart shows this will clearly decrease the total amount of wages to be given to the workers.

RECOMMENDATIONS

INVENTORY MANAGEMENT PROBLEM

1) Maintain a buffer stock to deal with uneven and unpredicted demands.

2) The variety of products in the garage is high, decrease the variety and focus more on the limited product range.

3) Try pushing products with high profit margin even if they are selling less in the volume.

WORKFORCE MANAGEMENT PROBLEM

1) Fire one of the permanent workers currently working in the garage.

2) A better skilled labor should be hired.

3) Both the current employed workers will be given raise and have same amount of wages to avoid any envious behavior during work.

4) The old permanent worker will learn in the shadow of new more skilled worker and will become a better asset for the garage.

5) This will end the need to hire extra workers and the productivity of the garage will increase due to less commotions.