

Evaluation and Improvement of Plant Inventory and Layout Design in Automobile Service Industries

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ABSTRACT: This paper attempts to give a general view about the existing auto repair workshop layout and plant inventory in indore automobile service center. The survey shows that plant layout affect the time management and improved amount of the services. Plant layout design reduced time and increase no of services. The plant inventory control gives the after suggestion net profit improve and break-even point reduced. This paper shows improve plant inventory and control of using proposed suggestions. The workshop fixed cost, personal cost not affected. Chapter study shows improved service quality and net profit with reducing BEP.

KEYWORDS: BEP, Flow chart, Fixed assets, Layout, Plant inventory.

I. INTRODUCTION

A maintenance station is a place where in addition to care of the motor vehicle like mechanical maintenance and minor repairs, petrol is supplied, cars are lubricated, cleaned, washed and other types simpler maintenances that are required daily are performed. In general it includes a number of sections like garage general maintenances, mechanical maintenance, major repair shop, tyre shop, paint shop, body shop etc.

Maintenance station facility layout means planning for the location of all machines, utilities, employee workstations, customer maintenance areas, material storage areas, aisles, rest rooms, lunchrooms, drinking fountains, internal walls, offices, and computer rooms, and for the flow patterns of materials and people around, into, and within buildings. Through facility layouts, the physical arrangement of these processes within and around buildings, the space necessary for the operation of these processes, and provided the space required for support functions.

Plant Inventory and its control is an aspect that has received considerable attention in contemporary times. This is attributed to the fact that salvaging the challenges posed by inventory drawbacks lies at the heart of management considerations and decisions in companies. For clarity, "Plant Inventory Control focuses on Fixed cost, personal cost, acquiring, storing and managing the inventory in such a manner that it is available as and when due so as to cater for contingencies, maximize profit and to minimize wastage, losses or dismaintenance to the customers. It is worthy of note that lost sales due to dismaintenance are enormous.

II. RELATED WORK

These two layout processes are designed to help organize the development of the overall layout of the warehouse. Hassan[13] defines the process for designing the layout of the storage area within a distribution center. There are several high level steps or phases that need to be completed when designing a distribution center. Within these steps and phases are decisions and processes that need to be completed and decided upon before moving forward. These design phases presented by Rouwenhorst are concept, data acquisition, functional specifications, technical specifications, selection of means and equipment, layout and selection of planning and control policies. The primary goal of these steps is to get maximum throughput with the minimum amount of investment and operational cost.

Tompkins et al. present a different set of design steps. These steps are: define the problem, analyze the problem, determine the space requirements for all activities, evaluate alternatives, select the preferred design and implement the design. according to Isotupa (2005), to show that some of the equipments/parts are very critical for the smooth running of the operations and needs to be serviced on a priority basis, while other equipment is less critical and will have lower priority. The two extremes are Ordinary/Priority as was used by Isotupa (2005), Critical/Non-critical as was used by Rosetti and Thomas, Gold and silver as was used by Vicil and Jackson (2006) and High/Low Priority Demand as was used by Okonkwo (2010) and so many other authors. Hassan (2002) defines the process for designing the layout of the storage area within a distribution center. The steps are taken out of a list that is to be used for the overall layout of a warehouse. Meller and Gue (2006) introduced the idea of the Fishbone Racking Model as a way to reduce the labor cost in the picking process.

III. EXISTING LAYOUT OF SERVICE STATION

The main performance measure of the layouts evaluated in this research is the distance the employee has to travel to complete their task. In order to calculate that distance, the amount of blocks that the employee passed through from one location to the next was shown in flow chart fig. 1, in maintenance station shown in fig 1, vehicle travel in multiple block so worker travel time is long. Vehicle maintenance time is also long.

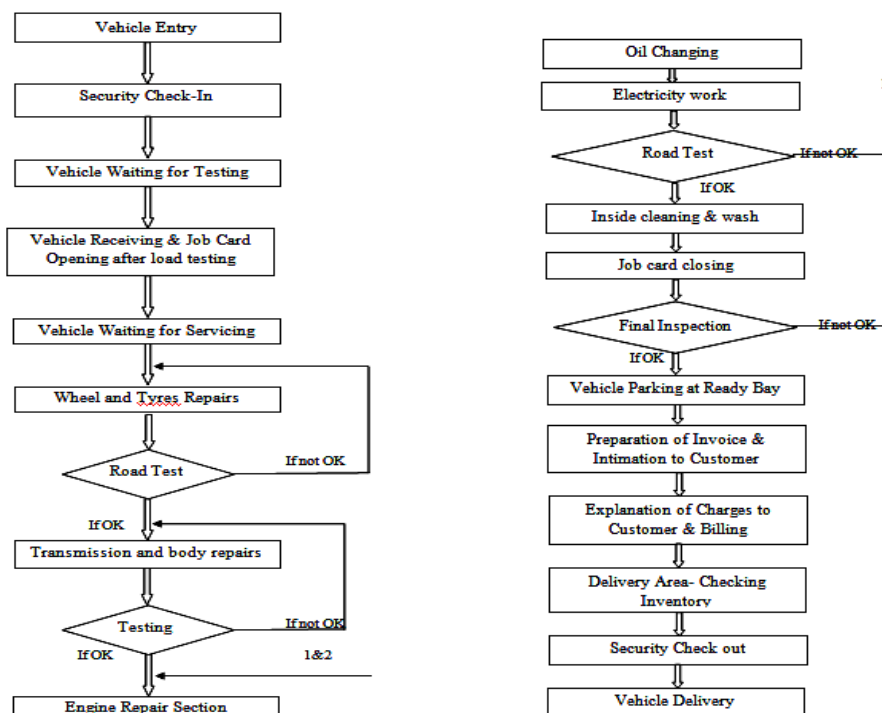


Fig.1, Existing workshop layout flow chart

Customer to be entering the Workshop. Opening the Job card with the help of Job slip and explain very clearly to the customer regarding demanded jobs and the cost estimate before commencing the work. Wheel or tyres repairs, after road testing transmission and body repairs. After body repairs vehicle go to engine room and check oil, after engine room vehicle go to cleaning and washing department. After test driving vehicle ready for delivery.

IV. IMPROVEMENT OF LAYOUT

The internal layout of a garage should be such as to make it water proof, clean and spacious to provide sufficient space for small workbenches to storage and repair benches. Following considerations should be made in the layout of garage and maintenance stations:

- To provide light to the workbenches, openings the windows should be provided at the proper place.
- To keep the floor cleanable, it should be a smooth concrete floor with a surface-scaling compound.
- The doors are provided as many members as required for easy flow of men and materials.
- To form a neat storage for hanging tools, hooks or screw eyes should be provided on the pegboards.
- To provide a deposit of waste material.

A) Maintenance in Entire Workflow

- Customer to be attended within 5 minutes after entering the Workshop.
- Opening the Job card with the help of Job slip and explain very clearly to the customer regarding demanded jobs and the cost estimate before commencing the work.
- The vehicle will be handed over to the shop floor

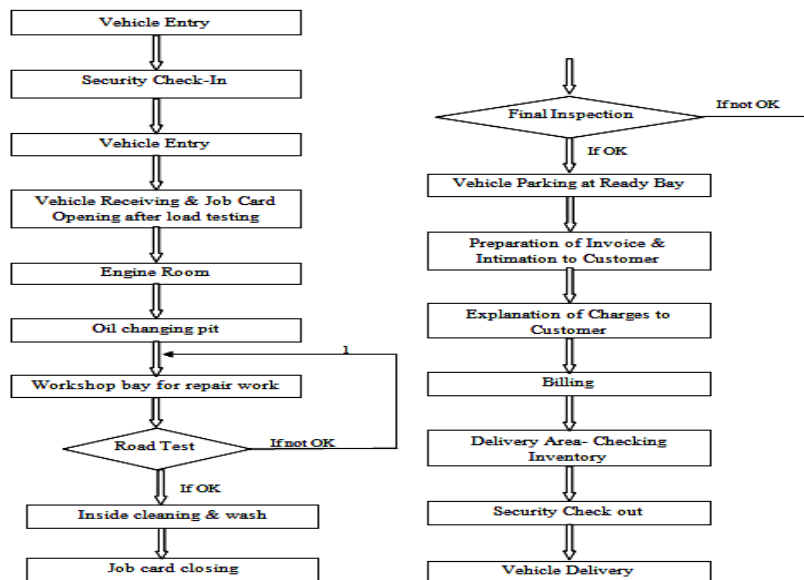


Fig. 2, Improvement layout Flow chart

- After completing all the Jobs, as per the requirement of job card. Only after completion of the works demanded by the customer, the vehicle will be passed through Final Inspection.
- Final rejection analysis done reason to each case & technician wise, accordingly counter measure are taken.
- The vehicle ready status will be informed over phone or through SMS.
- The customer is explained properly about the charges and the jobs carried out at the time of delivery with the Performa Invoice and original invoice after his acceptance.

V. FIXED ASSET

Land & Building: Working Shed, Store and Parking 500 Sq Mtrs, Office and Customer lounge 100 Sq Mtrs on monthly rent basis.

A) Machinery and Equipments Expenses

S. No.	Description	Qty (Nos.)	Value (Rs.)	Total (Rs.)
1	Complete Mechanical Toolbox	5	15000	75000
2	Complete Computerized Alignment Equipment with all accessories and sensors, printer etc	1	380000	380000
3	Computerised wheel balancing machine for all type of wheels up to 65 kg. Weight and maximum 850 mm of external wheel diameter with all standard accessories	1	150000	150000

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4	Semi-Automatic tyre changer	1	30000	30000
5	Construction of 5 ½ feet deep Pit for vehicle Inspection and precision wheel alignment jobs	5	10000	50000
6	Work Bench	3	4000	12000
7	Vices & fixtures	LS	7000	7000
8	Voltmeter / Ammeter	2	5000	10000
9	Two post vehicle lift suitable for lifting Cars and LCVs upto 3 Tons capacity.	1	40000	40000
10	Hydraulic Puller Jack	4	3000	12000
11	Air Compressor (2 HP; 1k lbs)	2	15000	30000
12	Piston Pump with piping and nozzle	1	12000	12000
13	Water tank, oil collection tanks and bins	LS	25000	25000
14	Battery Charger	1	10000	10000
15	Drill Machine (Hand)	1	3000	3000
16	Buffing Machine (Hand)	1	3000	3000
Total of Plant & Machine				849000/-
Electrifications and installations @ 5% of M/c Cost				42450/-
Electrifications and installations @ 5% of M/c Cost				LS 90000/-
Pre-operative expenses @2.0 %				16980/-
Total Fixed Capital				998430/-

B) Working Capital (per month)

S.No.	Staff and Labor	Nos.	Rate (Rs.)	Amount (Rs.)
1.	Manager	1	25,000	25000
2.	Supervisor	1	15,000	15000
3.	Clerk/Accountant/ sales staff	2	8000	8000
4.	Skilled Workers	3	10,000	30000
5.	Semi-skilled Workers	5	5000	25000
6.	Helpers / Un skilled Worker	8	3500	28000
7.	Peon/Chowkidar	1	3,500	3500
8.	Sweeper	1	2,500	2500
Total				137000
Perquisites @ 10% of Salary				13700
Total personal Capital				150700/-

C) Raw Material Expenses

S.No.	Raw Materials	Qty.	Amount (Rs.)
1.	Bush, break shoes, filter, points, clutch plates, spark plugs, nuts / bolts, rubber lining, adhesive, etc.	LS	1,00,000
2.	lubricants, brake oil, coolant, battery water, etc.	LS	2,00,000
3.	Cleaning detergent, Wax polish, dashboard cleaner etc	LS	50,000
4.	Other Misc Items	LS	25,000
Total			375000/-

D) Other Contingent Expenses

S.No	Contingent expenses	Amount (Rs.)
1.	Rent	30,000
2.	Postage and Stationery	500
3.	Telephone expense for customer care and PR	4,000

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4.	Repair and maintenance	1,500
5.	Transport charges	4,000
6.	Advertisement and publicity	2,500
7.	Insurance	3,500
8.	Sales expenses	5,000
9.	Misc Expenses	3,500
Total		54500 /-

E) Utilities Expenses

a)	Power 1600 Units @ Rs. 6 Per Unit	Rs. 9,600
b)	Water Charges (L.S.)	Rs. 5,000
Total		Rs. 14,600

Total Recurring Expenditure (per month)

1.	Staff and Labor	Rs. 150700/-
2.	Raw material	Rs. 375000
3.	Utilities	Rs.14,600
4.	Other contingent expenses	Rs. 54,500
Total		= Rs. 596800/-

Total Capital Investment

Total Fixed Capital	Rs. 998430/-
Total Recurring Expenditure (for 3 months)	Rs. 1790400/-
Total =	Rs. 2788830/-

VI. FINANCIAL ANALYSIS

Cost of Servicing (per annum)

1.	Total recurring cost per year	Rs. 7161600/-
2.	Depreciation on plant and machinery @ 10%	Rs. 80000
3.	Depreciation on Computerized Machines @ 10%	Rs. 30000
4.	Depreciation of office equipment @ 10%	Rs. 14000
5.	Interest on Capital Invested @ 10%	Rs. 390436/-
Total	=	Rs. 7676036 /-

A) Turnover (per annum)

S.No	Total Sales (per annum)	Qty. (Nos.)	Maintenance rate (Rs)	Approximate Cost of bought out items	Amount (Rs.)
1	Normal Maintenance Servicing with change of lubricants	3,000	600	1,800	7200000/-
2	Major Repairing work & Engine Overhaul	36	12,000		4,68,000
3	Wheel Alignment	300	400	--	120000/-
4	Wheel Balancing	1500	300	--	450000/-
5	Car wash and polishing	2000	300	--	600000/-
Total					8838000/-

Net Profit (per annum) = Turnover – Cost of Production

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= 8838000 - 7676036

= 1161964/-

Net Profit Ratio

= (Net Profit per Year/ Turnover per year) X100

= (1161964/8838000) X100

= 13.1%

Rate of Return

= (Net profit per year / Total Capital Investment)X100

= (1161964/2788830)X100

= 41.6%

B) Break-even Point

Fixed Cost (per annum)

1.	Rent per Annum	360000
2.	Interest on total capital investment @ 12 %	390436
3.	Depreciation of machinery & equipments @ 10%	80000
4.	Depreciation on Computerised Machines @ 20%	30000
5.	Depreciation of office equipment @ 20%	14000
6.	Insurance	30000
7.	40% of salaries and wages	21098
8.	40% of other expenses including utilities and excluding rent & insurance	144000
Total Fixed Cost (Rs.)		1069534/-

B.E.P

= [Fixed Cost /Fixed Cost + Net Profit)] X100

= [1069534/(1069534+1161964)] X100

= (1069534/2231498) X100

=47.9%

VI. PROPOSED PROFIT RATES

After the suggestion of layout design up gradation, travelling time will reduced so improved number of car maintenance increase. After up grade the skill of workers increase number of car maintenances. We can say these proposed suggestion improve in the maintenance center approximate 20 cars per month increase so overall profit will increase.

A) Turnover (per annum)

S.No	Total Sales (per annum)	Qty. (Nos.)	Maintenan ce rate (Rs)	Approxima te Cost of bought out items	Amount (Rs.)
1	Normal Maintenance Servicing with change of lubricants	3000 +240 = 3240	600	1,800	1944000+ 5832000 =7776000/-
2	Major Repairing work & Engine Overhaul	36 +2 =38	12,000		456000/-
3	Wheel Alignment	300 +20 =320	400	--	128000/-
4	Wheel Balancing	1500 +20	300	--	457500/-

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		=1525			
5	Car wash and polishing	2000+ 25 =2025	300	--	607500/-
Total cost in Rs.					9425000/-

Net Profit (per annum)

= Turnover – Cost of Production

= 9425000-7676036

= 1748964/-

Net Profit Ratio

= (Net Profit per Year/ Turnover per year) X100

= (1748964/9425000) X100

= 18.5%

Rate of Return

= (Net profit per year / Total Capital Investment)X100

= (1748964/2788830)X100

= 62.7%

B) Break-even Point

Fixed Cost (per annum)

S. No.	Types of cost	Amount
1.	Rent per Annum	360000
2.	Interest on total capital investment @ 12 %	390436
3.	Depreciation of machinery & equipments @ 10%	80000
4.	Depreciation on Computerised Machines @ 20%	30000
5.	Depreciation of office equipment @ 20%	14000
6.	Insurance	30000
7.	40% of salaries and wages	21098
8.	40% of other expenses including utilities and excluding rent & insurance	144000
Total Fixed Cost (Rs.)		1069534/-

B.E.P

= [Fixed Cost /Fixed Cost + Net Profit)] X100

= [1069534/(1069534+1748964)] X100

= (1069534/2818498) X100

= 36.9%

Presently net profit is 13.1% after improvement of worker skills and layout diagram net profit is 18.5%. Presently rate of return is 41.6%, after suggestion it will increase 62.7%. The BEP 47.9% in present time, after proposed suggestion it will decrease 36.9%.

We can say in above calculation have proved that, if taken our suggestion improved the net profit and rate of return will increase. Break-even point will decrease after suggestions.

VII. CONCLUSION

The main performance measure of the layout evaluated in this research is the distance the employee has to travel to complete their task. In order to calculate that distance, the amount of blocks that the employee passed through from one location to the next. Approximate one hours per day is extra use to long distance employee passed through from one location to the next. In a week 7 hours is extra use the existing layout. In our suggested layout design gives extra 7 hours per week. The time increase so no of car servicing also increasing so overall profit of the service station will increase. In another suggestion if the working hours can be extended from 10 hours to 12 hours, as in normal course

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most of the high segment vehicle customers prefer to take delivery of their vehicles in the evenings. Apart from telephonic information about vehicle readiness status to the customer, SMS intimation can also be provided. The pick & drop facility can be provided to the customers who leave their vehicle for maintenance and they may be provided transportation facility to return back to their office or residence.

This paper shows improving plant inventory and control of using proposed suggestions. The workshop fixed cost, personal cost not affected. Chapter study shows improved service quality and net profit with reducing BEP. Presently net profit is 13.1% after improvement of worker skills and layout diagram net profit is 18.5%. Presently rate of return is 41.6%, after suggestion it will increase 62.7%. The BEP 47.9% in present time, after proposed suggestion it will decrease 36.9%.

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