Application of Queuing Model on Petrol Pump

Rakshanda Agashe[1], Sandip Rathod[2], Roshan Ramteke[3], Dr. R.H. Parikh[4]
[1, 2, 3] Dept of mechanical Engineering
[4]prof, Dept of mechanical Engineering
[1, 2, 3, 4] K.D.K. College Of Engineering

Abstract- *Queingtheory is mathematicaly study of waiting line, waiting lines are common occurence in everybody's daily life. It is about waiting line to take any kind of service. All situations where there is involvement of customers, there are likely to have queues. Most commonly it is seen in petrol stations. In petrol stations there are long queues which sometimes lead to scarcity of product causing the buyers to wait for long. Standing in line can cause extreme boredom. In this paper, single channel with multiple server models is considered to reduce the waiting time.*

Keywords- Queuing Theory, Queuing Model, Server, Average Waiting Time

I. INTRODUCTION

Large numbers of customers are seen standing in a queue in petrol stations, booking counters, theatres etc to have some service carried out. This waiting problem led the Danish Engineer A. K. Erlang to work for it. He worked for Copenhagen Telephone Exchange and developed queuing theory in 1903.

There are various types of service disciplines in which customers can be served. It may be first in first out or last in first out or on the basis of priorities. Service is provided to the customer by installing single server, parallel server or tandem queue.

II. LITERATURE REVIEW

We have studied various literature reviews related to our project. We have come up with the following important literature reviews:-

[1] Dr. R. K. Shrivastav in his paper in his paper about the queuing problem. In general it is about waiting line to take any type of service in any type of store. Operation research plays a big role in solving such problem. Queuing model has been recently used by number of researchers in the field of mathematics and management.

[2] M. Reni Sagayaraj described in his paper that there had always been long queues. This led the buyers to wait for more than hours.

III. METHODOLOGY

The research is carried out by visiting a petrol station for 14 days and observing the people with two wheelers. The data was collected in different phases of day i.e. morning, afternoon, evening. Total time spent by the customer in the queue and in the system was recorded.

Description of the Petrol Station:-

Owner – Mr. Ravindra Bihari **Address -** Wardhaman Nagar, CA Road, Nagpur

Plant Layout -

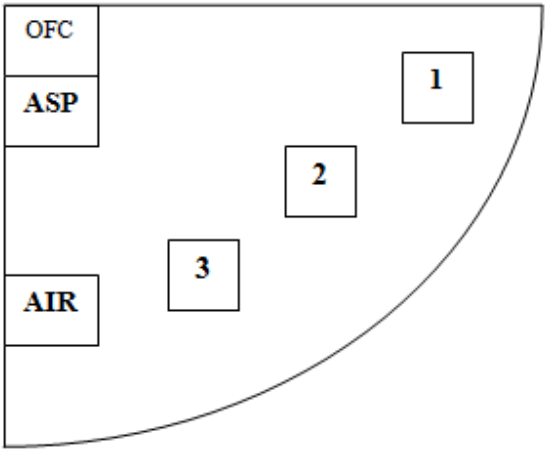

Fig. 1: Plant Layout

OFC – Office
ASP – Automobile Spare Parts
AIR – Air Centre
1- Green Petrol + Diesel
2 – Green Petrol + Diesel
3 – Power Petrol

Arrival rate, Λ in vehicles/min
Service rate, μ in vehicles/min
No. of Servers, S=3

No. of vehicles, N
Total Service Time, TST in mins

Calculations: -

1. Traffic intensity, $\mathbf{P = \Lambda / \mu}$
2. The probability that the system should be idle, $\mathbf{P_0=\{\sum_{n=0}^{s-1} P^n/n! + (P^S/S!)\ (1- P/S)\}^{-1}}$
3. No. of customers in a queue, $\mathbf{L_q= (P_0*P^{S+1}) / [(S-1)!*(S-P)^2]}$
4. No. of customers in the system, $\mathbf{L_s= L_q+ \Lambda/\mu}$
5. Waiting time in the queue, $\mathbf{W_q= L_q/\Lambda}$
6. Waiting time in the system, $\mathbf{Ws = W_q+(1/\mu)}$

Observations:-

	M1	M2	M3
N	882	345	332
TST	594.31	233.11	223.99
Λ	4.89	5.75	5.53
μ	1.48	1.48	1.48
P	3.30	3.89	3.73
P_0	0.11	0.11	0.11
L_q	4.18	6.24	1.52
L_S	7.48	9.40	4.35
W_q	0.82	1.25	0.38
W_s	1.50	1.92	1.05

IV. CONCLUSION

Queuing models is designed to provide services which are –

1. Fast
2. Cost Effective
3. Comfortable
4. Efficient
5. Safe

The system eliminates

1. Time wastage
2. Space constraints
3. Risk

REFERENCES

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