

Abstract No: MP-08

A Performance Analysis of a Filling Station using ARENA Simulation: A Case Study

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The service industry in Sri Lanka is facing the challenge of improving its performance. Thus analyzing its contemporary status is compulsory. This study focused on a petrol filling station in Sri Lanka. The selected system had only one petrol counter with one pump. But it was located in the town area. Therefore, many customers were getting its service, creating a long queue in many times at the filling station. This problem motivated the study to analyze the existing performance with the objective of finding the rate of service provision, average waiting times of customers in the queue and the system and the number of customers waiting in the queue. The study recorded customer arriving and service receiving times as data through direct observation of the system from 2.00 to 4.00 pm of three consecutive weekdays. The sample was 150 observations and both inter arrival times and service times were calculated using them. The system was considered as a single server queuing system with infinite waiting room capacity. Also, the population was infinite. The customers did not leave without being served and the service discipline was identified to be First-Come-First-Served. The study analyzed data using the student version of Rockwell ARENA 14.5. The inter arrival times and service times were then input to the Input Analyzer and obtained Beta and Gamma distributions respectively for them. The system was modeled in ARENA model window with the modules in both basic process and advanced transfer panels. The study ran the model for two hours replication length and gained results. Accordingly, the average service rate of the filling station was 92.6% and average waiting times of a customer in the queue and the system were respectively 4.29 and 5.16 minutes. Also, the average number of vehicles waiting in the queue was six. Therefore, the study recommended to improve the system performance by installing another new service counter with a single pump in the filling station or facilitating the existing counter with another pump considering the economic feasibility. Moreover, a counter with one employee can be located separately to do money transactions and issue the bills. This would also support to minimize the total waiting time of a customer in the filling station.

Keywords: ARENA Simulation, Filling Station, Performance Analysis, Queuing Systems, Service Industry