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Simulation-based network optimization for petroleum distribution in Sri Lanka: A systematic review of literature

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Petroleum is one of the industries that has a massive impact on living conditions of the population. Petroleum industry contributes for transportation, power generation, agro chemicals, residential, commercial and industrial needs etc. Petroleum distribution network plays an increasingly important function in delivering value to the end user. Petroleum industry's complexity has grown as a result of tight competition, strict environmental regulations, high operational costs and low margin of profits. The petroleum product demand fluctuation and the present scenario of high petroleum crude oil price fluctuation demonstrate that industries and markets all over the world are impacted by the volatility and uncertainty of the petroleum industry. These reasons drive petroleum industry toward strategic planning and optimization with respect to the uncertainties and constraints in factors such as the source, raw materials availability, expected market demand, production costs and distribution costs. The objective of this research is to study the current petroleum distribution network in Sri Lanka, identify the inefficiencies and critical factors causing inefficiencies and to propose a simulation-based optimization model to overcome these inefficiencies. A conceptual framework has been developed based on the findings observed from critical review of literature and further data was collected from Sri Lankan petroleum industry domain experts using in-depth interviews. The qualitative analysis of data has been done to evaluate the research findings. With the computational constraints of solving petroleum distribution network problems, a few optimization and approximation approaches have been introduced in the recent past. It has been identified that Sri Lankan petroleum distribution network has not been taken in to account for the optimization. Hence, this paper expects to introduce an innovative mathematical model for the optimization. The proposed model will be validated with complex and real data extracted from Sri Lankan petroleum industry. Subsequently, simulation is used to create scenarios on the designed model. Thus, this study depicts a simulation-based distribution network optimization model, with the purpose of minimizing the cost, based on inefficiencies and contributing critical factors, which are specific for Sri Lankan petroleum industry. As a result, the developed optimization model would enable the Sri Lankan petroleum industry to achieve higher performance leading to competitive advantage.

Keywords: Cost, inefficiencies, optimization, petroleum distribution network