

Chapter 11

ANN Prediction Analysis of Engine Performance and Emissions Characteristics Using a New Set of Plastic Pyrolysis Oil Blended With Pure Diesel

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ABSTRACT

Artificial Neural Network a soft tool enabled by Artificial intelligence was utilized to accurately predict engine performance and emissions analysis using a new set of plastic pyrolysis oil blended with pure diesel. Under various loads, blends, and speeds, this chapter analyzed the effect of plastic pyrolysis oil (PPO) on a diesel

DOI: 10.4018/979-8-3693-7250-0.ch011

engine's performance and emissions, which were used to forecast performance and emissions. The ANN models have the potential to produce a more accurate estimate of the brake thermal efficiency, brake-specific fuel consumption, and emission performance parameters.

1. INTRODUCTION

The conversion of solid wastes into fuels that have acceptable chemical and physical qualities for use in internal combustion engines may be accomplished using pyrolysis, which is an environmentally beneficial and efficient method of conducting the process. At the moment, there is a significant need for energy all over the world, and the world is experiencing the consequences of global warming as a direct result of population increases (Agrawal, T, 2020). Furthermore, the usage of petroleum fuel is increasing regularly in the meantime. In recent years, there has been a substantial increase in the production of energy to counteract the demand for fossil fuels and to restrict the utilization of renewable sources of energy. Additionally, the government encourages the use of alternative fuels as an alternative to fossil fuels by giving additional funding for research initiatives that address the need for fuel and the control of pollution (Murugesan, A,2009). There have been several research papers that have shown that plastic pyrolysis oil (PPO) can be produced from renewable sources by utilizing thermochemical and chemical conversion techniques (Chaki, S., & Biswas, T. K,2023).

The breakdown of plastic into parts in the natural environment may be broken down into numerous distinct categories, including physical, biological, and chemical processes. Pressure, humidity, and heat from the sun are the primary agents in the natural processes that lead to the breakdown of matter. Plastics are made up of hydrocarbon chain polymers, which are derived from the refining of petroleum (Kumar, S., & Gautam, R,2023). Due to the chemical compounds that make up these plastics, the bond between the hydrocarbon monomers is extremely strong, which makes it difficult for the degradation process to take place at room temperature (32°C). Because of this, it is very challenging for enzymes and bacteria to break it down biologically, and as a consequence, the process of breaking it down takes an extremely extended amount of time. Research must be conducted into alternative renewable fuels, which may be obtained from other resources that are readily accessible in the nation (Ogunkunle, O., & Ahmed, N. A,2021). This is because reserves of petroleum-based fuels can be discovered in limited quantities across the planet.

The high compression ratio of compression ignition (CI) engines makes them attractive in the transportation industry. On the other hand, the emission and depletion of fossil fuels have made it a big environmental problem in recent years.

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