The main intention of this study is to deepen knowledge about the relevant phenomena involving a combustion process in a medium-duty transport diesel cycle engine, using two types of biofuels derived from sugar cane. The methodology followed is eminently empirical and is based on a wide range of parametric studies based on dynamometer tests, following the standards in force. The analysis of the results obtained comes directly from a broad base of information obtained directly from experimental tests using an engine model previously tested in a combustion process. Three fundamental aspects have been considered as evaluation variables for engine operation: performance, nitrogen oxide emissions (NO_x) and particulate matter emissions (PM). At all times, the information obtained has been used to gain a deeper understanding of the phenomena involved in the combustion process in diesel cycle engines and how this information can be used to reduce emissions and maximize engine performance. This work aims to study the *trade-off* effect for the same engine running under the same conditions for a fossil fuel and for two types of biofuels. The *trade-off* curves will be considered, representing the evolution of these two biofuels in terms of effective performance and NO_x and PM emissions when modifying the engine's power supply. Tests were carried out on a MAN D0834 LF05 diesel engine, supercharged by two turbochargers with intake air cooling (intercooler), with a compression ratio of 16.5 and a high-pressure EGR (Exhaust Gas Recirculation) system with gas cooling and both with a cooling system. Finally, the results of this study were satisfactory, as the PM and NO_x emissions met the ABNT standard (NBR 15634), which follows the EURO V legislation. These biofuels were below the maximum value set by the standard while maintaining their performance, which proves that they are a more sustainable fuel compared to fossil fuels.