The reduction of exhaust emissions with the help of water-containing fuels was achieved by the Strey research group already in 2003 through use of a microemulsion fuel, and a patent was applied for [DE 10334897A13]. Since then, the components and their compositions have undergone various improvements. Within the scope of this work, the formulation of highly efficient microemulsified fuels with diesel as well as GtL was successful, increasing the temperature-invariant region and achieving the commercialization-relevant physical specifications of conventional fuels. For this purpose, the microemulsified fuels were analyzed to determine their density, viscosity, surface tension, flash point, ash content, corrosivity, conductivity, structure and domain size (DLS and SANS), heat value and long-term stability. In addition, attention was given to the deviations occurring in industrial-scale production. For the first time, the microemulsified fuels were tested under nearly realistic conditions using a BMW 530D E39 on a roller dynamometer with a WLTP-cycle. Here standard measurements of the NO_x, CO, CO_2, HC and soot emissions were undertaken. Furthermore, a shift of the chemical composition of the soot from elemental carbon to hydrocarbon derivatives was determined. The investigation of the potential danger of the exhaust emissions to human health, the AMES Test and the breakdown of the chemical composition of the HC and soot emissions by GC-MS, offered an essential insight: Both hazard assessments clearly showed that irrespective of the quantity of the emissions, the application of microemulsion fuels lessens the risk potential. A detailed examination of the soot particles led to the realisation that the primary particles exhibit smaller diameters under operation with microemulsion fuel than with diesel fuel, however, the size of the agglomerates remains constant at 25nm. The essential conclusion is, however, that through necessary adjustments of the engine map, and through an on-demand water admixing and distribution within the fuel on nano-scale through the use of biogenic additives, the toxic emissions and their danger potential, and the fuel consumption, can be reduced.