The driving simulator is one of the main tools for development and investigation of driving behaviour and new assistance systems. To investigate the impacts of the driver behaviour on fuel consumption in a driving simulator a validated fuel consumption calculation is needed. This work describes the validation of fuel consumption calculated by a driving simulator. Two approaches were done. One method is to compare the calculated fuel consumption with a real car. For this the New European Driving Cycle (NEDC) was rebuild in the simulator to assess the fuel consumption and to compare it with a real car. The big advantage of the NEDC is that the test is repeatable and is obligatory for every car in Europe, so comparable data is available. It can be shown that the driving simulator has a comparable fuel consumption in the NEDC to a real car. The other approach in this study was to compare the distribution of fuel consumption of real car drivers with the distribution from drivers in the simulator. The results of a study with 30 participants in the simulator showed that the resulting fuel consumption is good comparable to real car data.