The unsteady 1-D model of the twin entry turbine was fully calibrated under steady flow conditions and utilized for the engine simulation without a turbine. For this test, a fully modular water test rig in which the mechanical power losses were measured, and the pressure drop across the turbine was calculated. The results were then used to validate the developed 1-D model.

Generalization of Results and Discussion

The map-approach described in the thesis as a comprehensive methodology enables to create the physical based model of any turbine. For the realistic admission and exhaust flow conditions, which can be different in each engine, it is possible to perform the simulations of the turbine behavior under different conditions. The current version to specific design and dimensions of the required turbine and recalibrate the new model under steady flow conditions is completely possible. The necessary amount of required measurements is relatively low, compared to classical map based approach, by virtue of the physical background of the model.

The specific turbocharger open-loop test bed for a twin scroll turbine is completely prepared and verified. The methodology of the measured data is verified and validated. The functional principle of the process of the 1-D turbine models also verified and newly used to be for any turbocharger.

The methodology described in the thesis for steady flow and transient turbocharger was validated in the future work by the others. The extrapolation of specific model's bearings would improve the precision of losses. The calibration procedure of the 1-D turbine model might be simpler and more versatile. The methodology of the process is used in the different turbocharger model development. The experimental values of the constants (KRF, exhaust gas recirculation valves (EGR), or turbine outlet oil film) should be performed in the future research. The long-time goals in the thesis are the further development of the methodology to a more precise and complete one.

Conclusions

The main goal of the thesis was to develop, validate and verify the comprehensive methodology, which utilizes the map-approach for pressure loss calculation of the turbine. The methodology enables to consider the pressure losses and to calculate the pressure drop through the turbocharger for different modes of operation. The methodology was validated under different conditions, which can be different in each engine, and recalibrate the new model under steady flow conditions. The validation of the methodology was performed in the future work by the others. The extrapolation of specific model's bearings would improve the precision of losses. The calibration procedure of the 1-D turbine model might be simpler and more versatile. The methodology of the process is used in the different turbocharger model development. The experimental values of the constants (KRF, exhaust gas recirculation valves (EGR), or turbine outlet oil film) should be performed in the future research. The long-time goals in the thesis are the further development of the methodology to a more precise and complete one.

Author's Publications Related to the Thesis


Simulation

The effect of the variation of the intake conditions on the turbine characteristics is evaluated. The dependence of the turbine efficiency on the intake flow conditions is also evaluated. The influence of the intake flow conditions on the turbine efficiency is evaluated. The dependence of the turbine efficiency on the intake flow conditions is also evaluated. The influence of the intake flow conditions on the turbine efficiency is evaluated.

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