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New combustion concepts like PPC and RCCI have demonstrated very high indicated efficiencies together with a potential for low engine out emissions. But the implementation of those combustion concepts in engine concepts remains a challenge. A number of issues like boosting, load range, EGR control and transients have to be addressed.

Integration of different technologies into an engine concept is done with gas exchange simulations. But how is the combustion in the gas exchange simulations modeled when new combustion concepts are utilized? Iterating with 1-cylinder testing and 3D combustion CFD is time consuming. In order to speed up the concept work, it is a necessity to exchange the right parameters between the simulation tools and reduce the number of iterations. This presentation shows how 1-cylinder testing, 3D combustion CFD and 1D gas exchange with DARS SRM are used together for fast and reliable predictions.

Combustion models of direct injected engines need to capture fuel and thermal stratification. A Stochastic Reactor Model approach such as DARS SRM addresses the stratification. The state variables are described with a probability density function and the cylinder gas mixture are discretized in a number of particles. This allows for a significantly more detailed chemistry than in combustion CFD.

For PPC, it is a requirement to include the mixing process since the combustion is more or less premixed depending on the load. This input is taken from combustion CFD or derived from 1-cylinder testing.

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