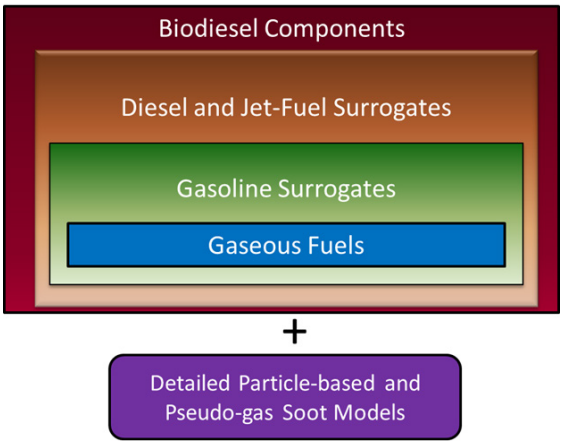
The Model Fuels Library:

Accurate Combustion Chemistry for the Real World

- **Detailed, well-validated fuel models for accurate simulation**
- **More than 65 master fuel components for a wide range of operating conditions**

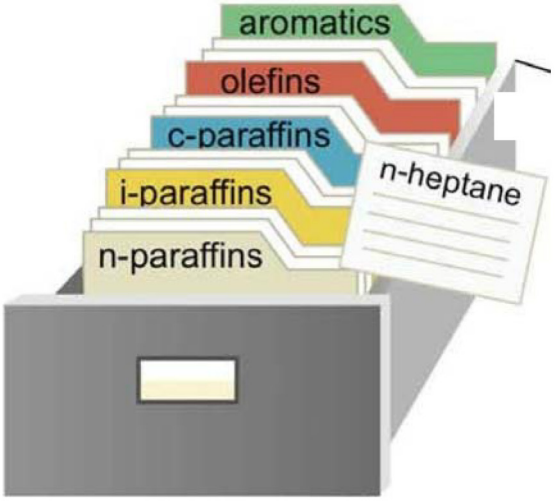
Today's engine and combustor designers are striving to attain low emissions and high efficiency more rapidly and at a lower cost than ever before. Combustion modeling can generate substantial savings in engine development cost and improved product quality. But challenges in achieving these benefits often arise due to inaccuracies in the fuel model. Engine designers have traditionally used severely reduced fuel models in combustion simulations. These models can require complicated tuning or adjustment in order to provide predictive results. Alternatively, advanced combustion simulation tools like ANSYS Forte and ANSYS Chemkin-Pro can take advantage of larger and more accurate fuel models and still provide fast time-to-solution. The Model Fuels Library provides a set of accurate real-fuel models that are easy to use in modern tools.

The Model Fuels Library (MFL) includes detailed and validated reaction mechanisms for over 65 fuel components that are relevant to combustion simulations in a wide variety of industrial and commercial applications. The fuel components can be used to represent gaseous or liquid fuel combustion for petroleum-derived or alternative fuels. Gaseous components include natural gas, synthetic gas, biofuels and blends. For liquid fuels, the fuel components can be used in formulating surrogates for a wide range of real-world fuels, including gasoline, diesel, jet fuel, alternative fuels, fuel blends and additives.



The reaction mechanisms are suitable for many combustion applications, including spark-ignition engines, compression-ignition engines, gas- and liquid-fired turbine combustors, boilers, flares and furnaces. The mechanisms have been extensively validated for operating conditions covering a wide range of pressures, temperatures, equivalence ratios and dilutions. The mechanisms are constructed in a self-consistent manner and follow a rate-rule–based approach for liquid components that results in predictive capabilities for the mechanisms. The predictive capabilities of library mechanisms are not limited to combustion characteristics of fuels, but also include fuel effects on emissions, along with soot particle size and number densities. The Model Fuel Library is based on both the outcome of the industry-driven Model Fuels Consortium (2006-2012) project and the ongoing Model Fuels Library Subscription Service that maintains the Library to keep it up to date with the state of current combustion science.

ANSYS Model Fuels Library



Representative Mechanisms Included in the Model Fuels Library
MFL includes well validated models for over 65. master fuel components that can be used to create accurate simulations for combustion of such common fuels as gasoline, diesel, jet fuel, FT fuels, natural or synthetic gas, biofuels and additives. Such fuels may be represented by "surrogate fuels" that are a combination of multiple MFL fuel components. The fuel components fall into chemical classes such as n-alkanes, iso-alkanes, 1-ring aromatics, 2-ring aromatics, cycloalkanes/naphthenes, olefins, oxygenated fuels and additives. In addition, the fuel mechanisms include soot precursors and emissions pathways.

Mechanism reduction with Chemkin-Pro Reaction Workbench:
Putting mechanisms in the Library is easy with Chemkin-Pro Reaction Workbench. Within Reaction Workbench, the Surrogate Blend Optimizer automatically determines the optimal surrogate blend to match real multicomponent fuel physical properties.
Reaction Workbench then automatically reduces mechanism size using a combination of reduction techniques.

- The user specifies target parameters and acceptable error tolerances
- Reaction Workbench automatically generates the smallest skeletal mechanism satisfying these specifications

Using the Model Fuels Library
The Model Fuels Library offering is encrypted for use with ANSYS software, including ANSYS Chemkin-Pro, Reaction Workbench, Energico, ANSYS Forte and ANSYS Fluent. With the Model Fuels Library, it is possible to model most real fuels by either exactly representing the chemical properties of the fuel or by formulating an appropriate surrogate. We recommend using ANSYS Chemkin-Pro/Reaction Workbench to formulate surrogates for liquid fuels, and also for reducing the master reaction mechanism to provide smaller mechanisms that can be tailored for a particular application (e.g., for use in computational fluid dynamics engine simulation).

The complete MFL is available as a paid-up or lease license and includes full access to all fuel components as well as pre-reduced mechanisms for common fuels. Library updates including access to new components and mechanisms are added on an annual basis along with technical support provided by ANSYS experts. The full source library is also available through the Model Fuels Library Subscription Service.

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