# Apparatus for Advanced Distillation Curve Measurement of Complex Fluids

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The distillation (or boiling) curve of a complex fluid is a critically important indicator of the bulk behavior or response of the fluid. For this reason, the distillation curve, usually presented graphically as boiling temperature against volume fraction distilled, is often cited as a primary design and testing criteria for liquid fuels, lubricants, and other important industrial fluids. While the distillation curve gives a direct measure of fluid volatility fraction by fraction, the information the curve contains can be taken much further; there are numerous engineering and application-specific parameters that can be correlated to the distillation curve. When applied to liquid motor fuels, for example, one can estimate engine starting ability, drivability, fuel system icing and vapor lock, the fuel injector schedule, fuel autoignition, etc. It can be used in environmental applications as a guide for blending virgin stock with reclaimed oil, guiding the formulation of product that will be suitable in various applications. Moreover, the distillation curve can be related to the mutagenicity and composition of the pollutant suite. It is therefore desirable to enhance or extend the usual approach of distillation curve measurement to allow optimal information content. In this talk, we present several modifications to the measurement of distillation curves that provide (1) temperature and volume measurement(s) of low uncertainty, and, most importantly, (2) a composition-explicit data channel in addition to the usual temperature-volume relationship. This latter modification is achieved with a new sampling approach that allows precise qualitative as well as quantitative analyses of each fraction, on the fly. The analysis is done by gas chromatography coupled with specific or universal detectors. This second modification is the most significant change, since composition is the most important underlying parameter that governs curve shape.