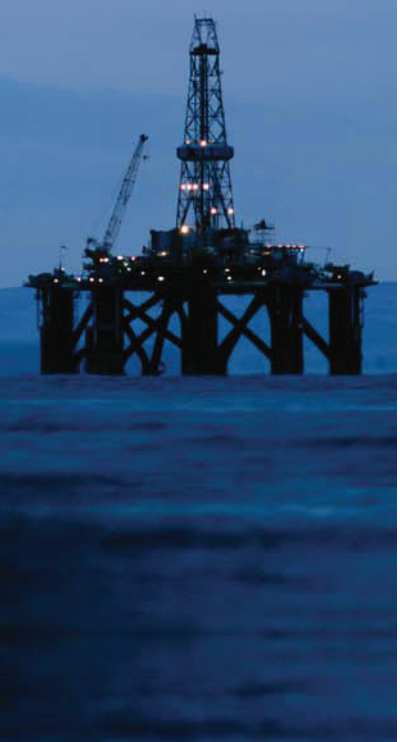
RESTEK
Pure Chromatography



Petrochemical Applications

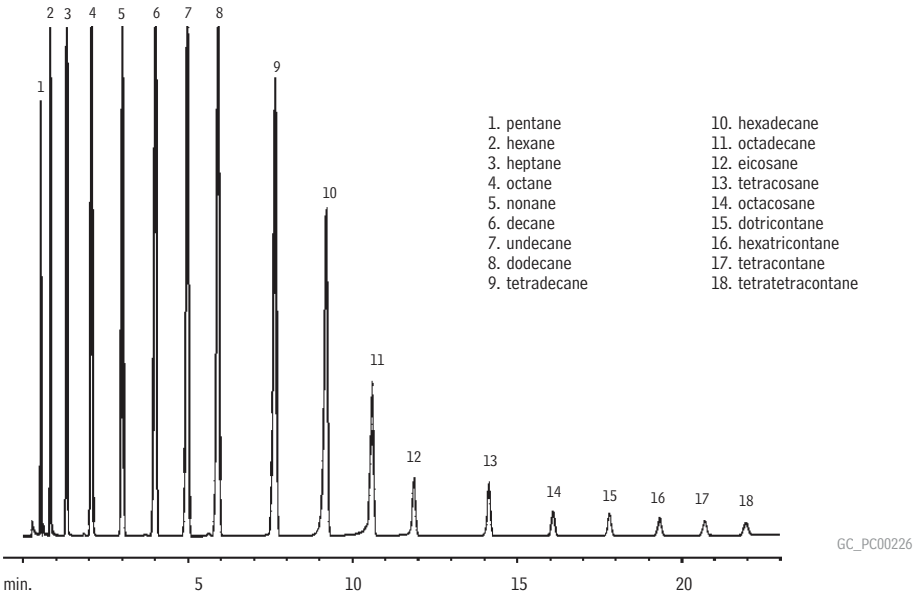
Rtx®-2887 / MXT®-2887

Restek's Capillary GC Columns for Simulated Distillation of Petroleum Fractions

Simulated Distillation (Sim Dist) is an analysis which determines the boiling range distribution of petroleum samples using gas chromatography with temperature programming. Different Sim Dist methods are employed depending upon the boiling range of hydrocarbons in the product to be analyzed. ASTM Test Method D-2887 is most commonly used because its scope specifies petroleum products with a final boiling point less than 538°C (excluding gasoline). This boiling range includes samples such as jet fuel, kerosene, diesel, and gas oil. Although this technique has been in use for many years, using mostly packed columns, ASTM D-2887 permits the use of 0.53mm capillary columns.[1,2] Capillary columns with cross-bonded stationary phases offer several advantages compared to packed columns, including lower column bleed, shorter conditioning times, shorter analysis times, and longer column lifetimes. Although the analysis is, in principle, very simple, there are some important column and instrument parameters which must be optimized to meet the criteria for column resolution, bleed, and peak skewing specified in ASTM Method D-2887.[3]

It is possible to calculate boiling range distribution from GC data since a nonpolar stationary phase operated under temperature programmed conditions will elute hydrocarbons in order of increasing boiling points. The chromatographic system is calibrated by injecting a mixture of *n*-alkanes to cover the hydrocarbon range of the samples. Figure 1 shows the complete analysis of the Simulated Distillation Calibration Mixture in under 23 minutes, using the Rtx®-2887 capillary column. A computer program constructs a calibration curve from the hydrocarbon retention times and their atmospheric boiling points, then uses this curve to calculate the boiling range distribution of the petroleum fractions. Sample area is integrated into area "slices" vs. retention time, then the boiling point for each cumulative area % is determined by the computer program. An example analysis of ASTM Reference Gas Oil #1 appears in Figure 2. Note that it is not desirable to resolve all the components in a single sample when performing Sim Dist, since a typical laboratory distillation used for petroleum analysis generates a limited number of theoretical plates.

Figure 1 Calibration of C5 to C44 standard, using an Rtx®-2887 capillary column (baseline compensated).



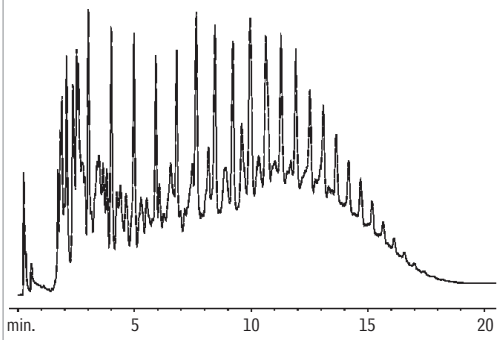
10m, 0.53mm ID, 2.65µm Rtx®-2887 (cat.# 10199)
1.0µL direct injection of a 0.1 to 0.01 wt % hydrocarbon standard in carbon disulfide
Oven temp.: 35°C to 360°C @ 15°C/min. (hold 5 min.)
Inj. & det. temp.: 360°C
Carrier gas: nitrogen
Linear velocity: 112cm/sec. (15mL/min.)

please **note**

Rtx®-2887 and MXT®-2887 columns are both optimized to exceed the resolution and tailing requirements specified in ASTM Method D-2887. The Rtx®-2887 column offers all the benefits of fused silica tubing and greater coating efficiency than metal tubing. Choose the MXT®-2887 column if you operate in a rugged environment, or at higher temperatures, and need the most durable column available.

It is important that the column and chromatographic conditions are set up according to the procedure specified in the ASTM standard.[3] Otherwise, one lab's results will not be comparable with results obtained by other labs. The Rtx®-2887 and MXT®-2887 column dimensions, stationary phase, and stationary phase film thickness are optimized to meet the requirements specified in the current version of the ASTM test method. For example, the resolution for C16/C18 is 8.7, which is within the specified range of 3 to 10 and the skewing factor for heptane is 0.92 which must be greater than 0.5 and less than 2. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, resulting in longer column lifetimes and shorter conditioning times when installing a new column. Each column is individually tested with a hydrocarbon mixture to guarantee a stable baseline with low bleed and reproducible retention times. This test assures Rtx®-2887 and MXT®-2887 columns will meet performance requirements specified in ASTM Test Method D-2887.

Figure 2 ASTM Reference Gas Oil #1 on an Rtx®-2887 capillary column (baseline compensated).



10m, 0.53mm ID, 2.65µm Rtx®-2887 (cat.# 70199)
1.0µL direct injection of a 0.1 to 0.01 wt % hydrocarbon standard in carbon disulfide.

Oven temp.:	35°C to 360°C @ 15°C/min. (hold 5 min.)
Inj. & det. temp.:	360°C
Carrier gas:	nitrogen
Linear velocity:	112cm/sec. (15mL/min.)

References:

1. Green L.E., Schumauch L.J., Worman J.C., Anal. Chem., Vol. 36, 1964 p.1512.
2. Green L.E., Hydrocarbon Processing, May 1976 p.506.
3. ASTM Test Method D-2887, 1996 Annual Book of ASTM Standards, Volume 5.02.

References not available from Restek.

Rtx®-2887 Column (fused silica)

(Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

ID	df (µm)	temp. limits	length	cat. #
0.53mm	2.65	-60 to 360°C	10-Meter	10199

MXT®-2887 Column

(Silcosteel® treated stainless steel)*

(Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

ID	df (µm)	temp. limits	length	cat. #
0.53mm	2.65	-60 to 400°C	10-Meter	70199

*Silcosteel® treatment is a proprietary surface treatment for passivating steel and stainless steel. U.S. Patent 6,511,760.

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