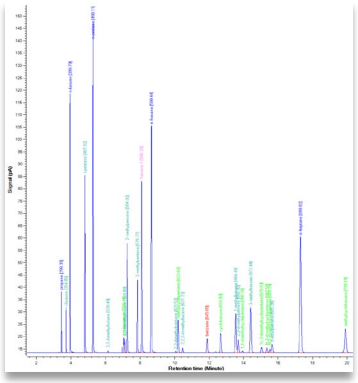
AC DHA combi: regular DHA and Front-end applications combined in one GC

- One analyzer: standard DHA & light-end in crude analysis
- Cost savings: both capex as well operational
- Ensured sample integrity
- Full method compliancy



Keywords: DHA, ASTM, Fast DHA, light-end of crude, combi

Introduction:

Many test laboratories in the hydrocarbon processing industry utilize a Detailed Hydrocarbon Analyzer to characterize gasolines ("spark-ignition engine fuels") and refinery streams such as naphtha's, reformates, alkylates, etc. These analyzers usually comply with ASTM methods, such as D6730, D6729 or D6733 or AC's unique Fast DHA. The standardization methods are typically strict with respect to the GC conditions and columns used.

In addition, there is often a need for these labs to analyze the light hydrocarbons in stabilized crude oils, so called DHA Front-end analysis. These analyzers are configured with a pre-column which separates the light fraction of the crude for further composition analysis on a long capillary column; the remaining heavy fraction of the crude oil is backflushed and vented without further analysis. Typical methods used for this are either ASTM D7900 or EN 15199-4. These methods are less strict in terms of the analytical column used.

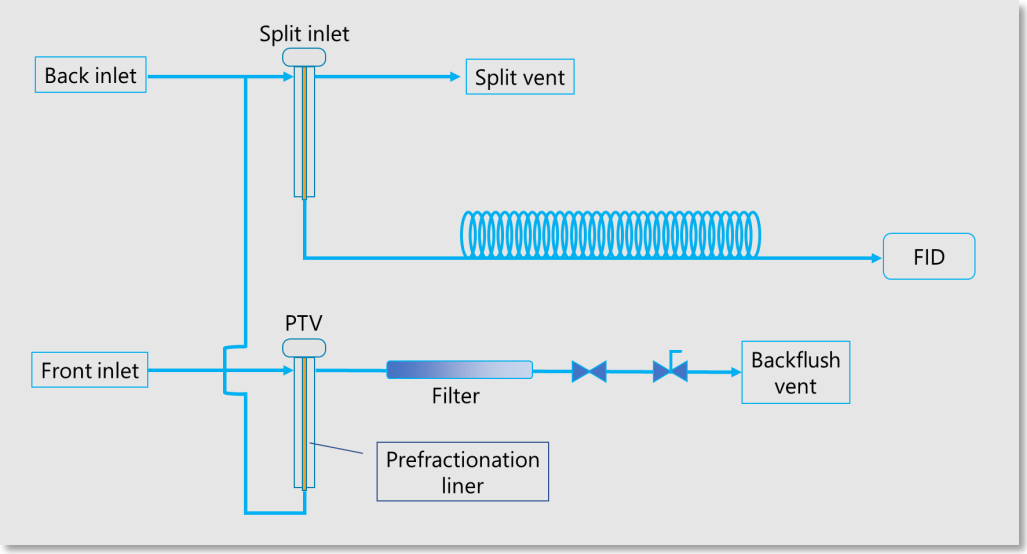
The specific method requirements result in the need to use two dedicated analyzers. This is a less desirable situation, because of the additional investments, operational costs and the laboratory space used. AC Analytical Controls has addressed this situation with the "**AC DHA combi**" analyzers. It is a cost-effective designed GC with one channel meeting all the requirements as stated by one of the ASTM methods (like e.g., D6730) and a second inlet with a pre-column dedicated to the analysis of the light hydrocarbons in crude oil. The light fraction of the crude is directed to the inlet of the standard DHA channel for separation as described by ASTM D7900 or EN 15199-4.

Major advantages of the AC DHA Combi analyzers are:

- compliancy with both standard DHA methods and the crude oil method
- one system means less investments and operational cost
- using less laboratory bench space
- separate injection ports, no cross-contamination

System configuration

The schematic diagram shows the configuration of an AC DHA Combi analyzer. The back inlet channel is a typical standard DHA configuration with a split/splitless inlet and column(s) as described by the standard ASTM method (see table 1).



The front inlet channel is similar to the inlet used in the unique AC DHA Front-end application. A PTV inlet fitted with a short column located in the inlet (similar to a regular inlet liner), which separates the crude by boiling point. The light fraction is directed to the split inlet on the back channel and from there it is introduced into the capillary column for further separation. The oven program used is based on the typical chromatographic conditions as described in the configured standard DHA method or in one of the light-end crude methods.

The remaining heavy fraction of the crude is backflushed to vent by reversing the flow direction in the inlet and raising the inlet temperature. The inlet will stay at an elevated temperature to ensure all crude residue is backflushed. The filter in the vent line prevents emission of hazardous components. With this configuration, the heavier part of the crude is not contaminating the standard DHA channel (it stays in the dedicated section), and therefore not influencing the regular DHA analysis in a negative way.

The AC DHA Combi is available for all ASTM DHA methods as well as the AC Fast DHA:

Table 1: Available AC DHA Combi configurations

Front-inlet	Back inlet: DHA method	Carrier gas	Capillary column
AC PTV pre-column	ASTM D6730	Helium	100m + 3m
AC PTV pre-column	ASTM D6729	Helium	100m
AC PTV pre-column	ASTM D6733	Helium	50m
AC PTV pre-column	ASTM D5134	Helium	50m
AC PTV pre-column	AC Fast DHA	Hydrogen	40m

The analyzers are always configured with one Automatic Liquid Autosampler (ALS) and for user convenience we recommend adding a second ALS. This will allow for both channels to be used via sequence without manually having to move the ALS and re-configure the system.

PAC DHA^{xlnc} software

PAC DHA analyzers include the IRIS based DHA^{xlnc} software. It is based on PAC's IRIS software platform, similar to the other PAC chromatography packages such as Reformulyzer and Simdis. The workflow oriented DHA^{xlnc} software is compatible with all major Chromatography Data Software (CDS) packages and can be installed either as a standalone workstation or in a network environment. It reduces data processing activities while increasing data quality, access and traceability. The entire process of data handling, from the moment of sample injection up to and including export of the results to LIMS, can be automated.

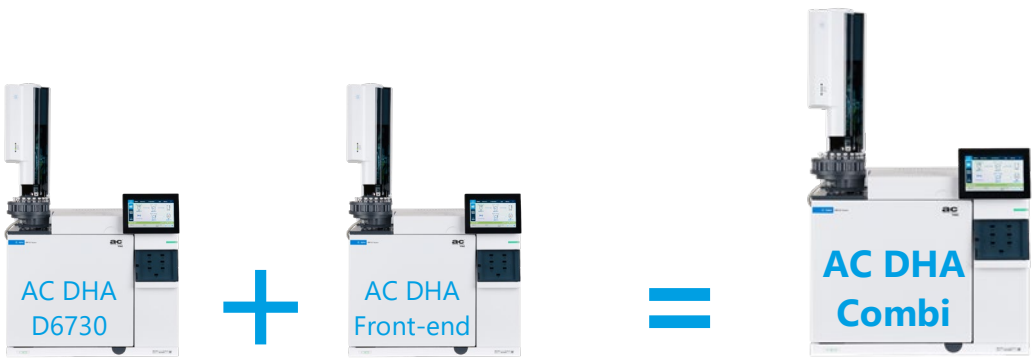
DHA^{xlnc} features a unique identification mechanism using Kovats indexes and is based on the concept of searching expected components related to the type of product analyzed and test method used. The selected DHA test method component database, is optimized for the standard application as chosen for the AC DHA Combi system. The fully configurable identification process includes compound identification based on ranking, co-elution handling with option to set compound ratio, drag-and-drop identification, smart filters and automated recalculation upon changes in the chromatogram.

Reporting options include the individual components (mass%, volume% & mol%) and also a carbon number versus group-type pivot table, boiling point distribution (for Simdis merge), RON, specific gravity and molecular weight.

Conclusion

The AC DHA Combi configurations are uniquely designed to meet the requirement of having two DHA applications, one for standard DHA applications and one for the analysis of the light hydrocarbons in crude oil, by combining them into one GC. The advantages are obvious:

- a lower investment, one system covering both applications, with full method compliancy
- lower operational cost
- less benchspace needed
- ensured sample integrity as there is no cross contamination between the crude and lighter products



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