



Jones Environmental Forensics

PIANO/PONA ANALYSIS

PIANO/ PONA analysis shows the relative concentrations of major hydrocarbon groups in fuels and is a very useful parameter for fuel type differentiation (including octane rating) and source correlation. It can also be useful for estimating alteration by weathering and biodegradation.

PIANO / PONA analysis is carried out by GC-FID and determines the following:

P - paraffins	P – paraffins and isoparaffins
I - isoparaffins	O - olefins
A - aromatics	N - naphthenes
N - naphthenes	A - aromatics
O - olefins	

- **Paraffins** - common name for group of normal alkane hydrocarbons. The simplest paraffin molecule is methane (gas at room temperature). Heavier members of the series, include octane (liquid a room temperature) and paraffin wax (solid at room temperature).
- **Isoparaffins** - common name for branched alkane hydrocarbons, also called isoalkanes.
- **Aromatics** - an aromatic compound is one which contains a benzene ring. Common aromatic compounds other than benzene include toluene and naphthalene
- **Naphthenes** – also called cycloalkanes, they are similar to alkanes in their physical properties but have higher boiling points and densities. Cycloalkanes are classified into small (cyclopropane and cyclobutane), normal (cyclopentane to cycloheptane) and larger cycloalkanes with greater than 20 carbon atoms typically called cycloparaffins.
- **Olefins** - also called alkenes or olefines. The simplest alkene is ethylene (also called ethene).

Fuel type	Paraffins	Isoparaffins	Aromatics	Naphthenes	Olefins
87 octane gasoline	9.59%	38.34%	38.61%	6.10%	7.36%
Aviation gasoline	3.33%	74.22%	21.92%	0.51%	0.01%

Table 1 - illustrating the difference in % composition of two fuel types

Most susceptible to weathering	Light hydrocarbons
↓	Olefins
↓	Paraffins
↓	Aromatics
↓	Isoparaffins
Least susceptible to weathering	Naphthenes

Table 2 – susceptibility to weathering

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