Fuel Analysis

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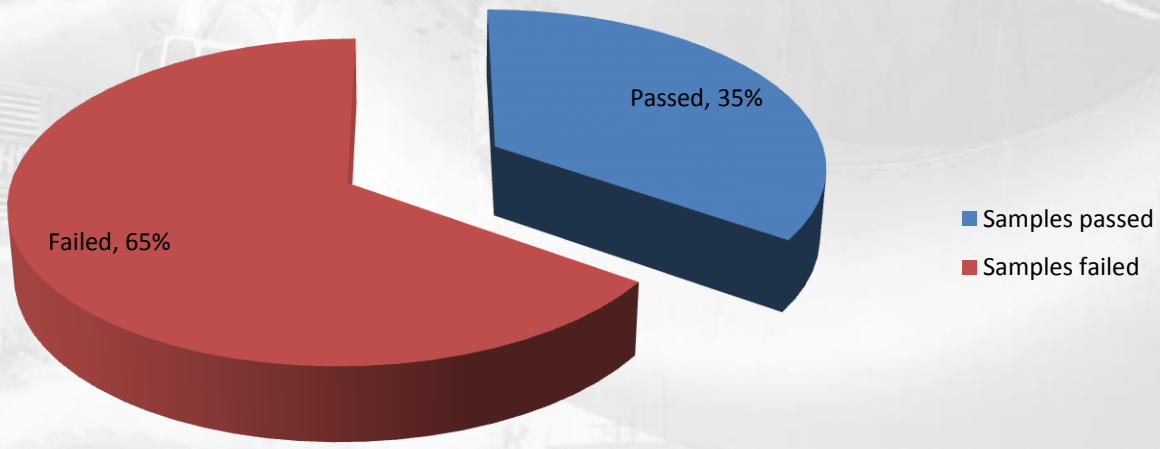
- ✓ Why We Analyse Fuel
- ✓ Lubricant Tests
- ✓ Fuel Tests

Conducting Postmortems

Actual Diesel Statistics

16 April 2012 – 16 October 2012 (6,985)



Diesel Statistics

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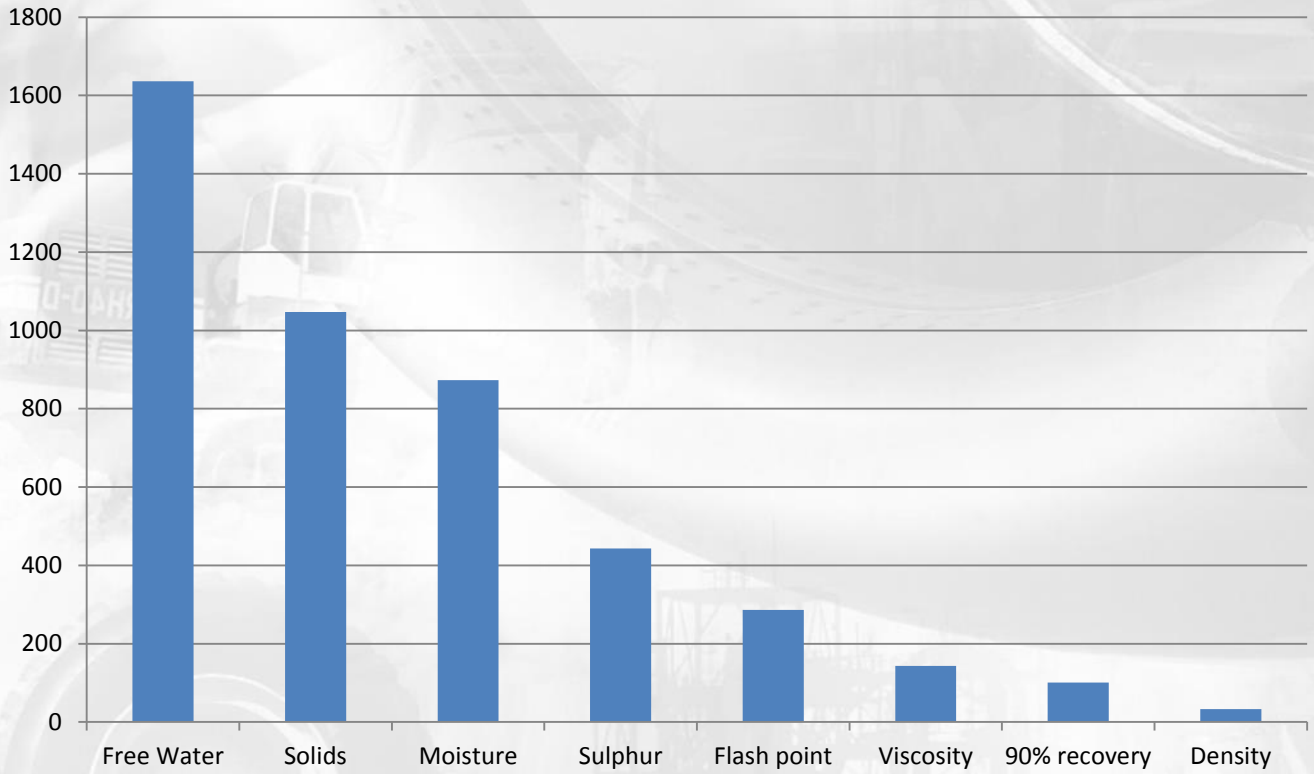
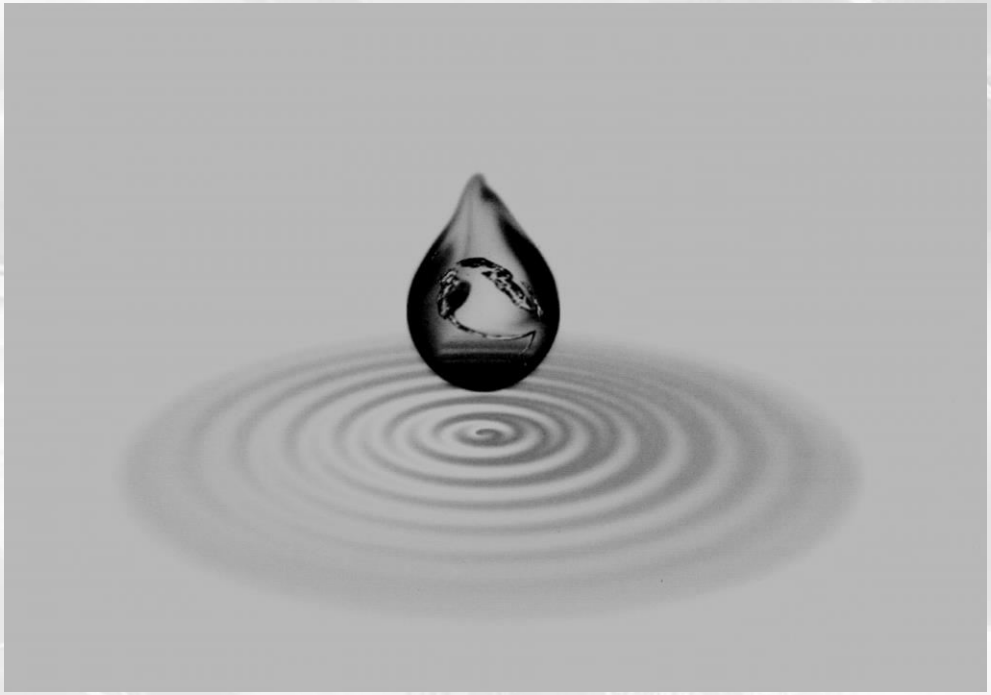


Fuel Tests



Fuel Tests

Flashpoint

- Minimum temperature at which diesel will ignite
- SANS 342: Minimum 55°C
- Low flashpoint can cause burnt injector tips
- Identifies petrol adulteration

Fuel Tests

Viscosity

- Low viscosity causes pump and injector wear
- High viscosity causes excessive pump loads
- High viscosity causes large droplet size, slow ignition, smoke and reduced power
- SANS 342: 2.2 cSt < vis < 5.3 cSt

Fuel Tests

Sulphur

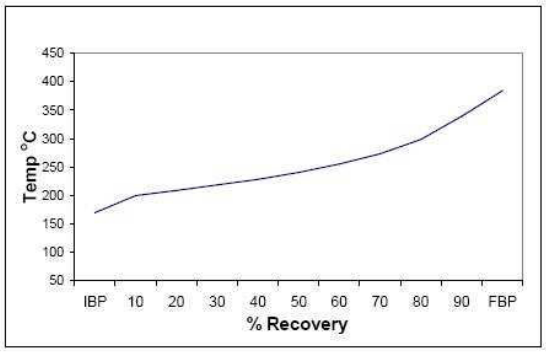
- Forms sulphur oxides which form strong acids
- Forms fine particulate matter
- SANS 342: < 500 ppm or < 50 ppm

Fuel Tests

Distillation

DISTILLATION DATA

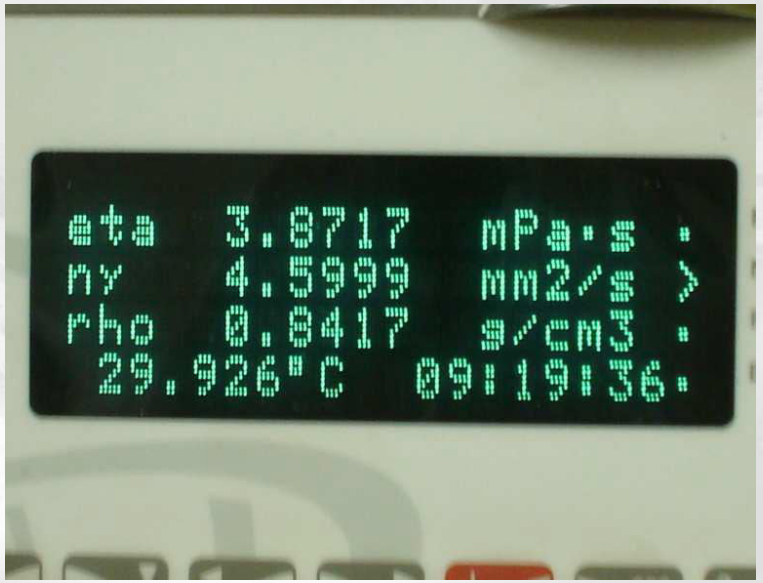
% REC	TEMP °C
IBP	169
10	199
20	208
30	218
40	228
50	240
60	255
70	273
80	298
90	339
FBP	384
% Rec	97.0
% Res	2.5
% Loss	0.5



- Measures temperature range at which fuel turns to vapour
- Determines starting, power, emissions, fuel economy
- Identifies adulteration of the fuel

Fuel Tests

Density



- Determines energy content of the fuel
- Can indicate IP contamination

Fuel Tests

Cetane Index

- Ignition quality of the fuel
- Determined by combination of distillation and density
- Low cetane index causes difficult starting, rough running emissions
- High cetane index causes premature ignition, burnt tips

Fuel Tests

Solid particulate contamination

- Dirt, rust, microbial contamination
- Causes blocked filters, pump and injector wear
- Gravimetric test
- SANS 342: < 24 mg / kg

Fuel Tests

Dissolved water

- Causes rust, microbial growth
- Can become free water when temperatures drop
- SANS 342: < 500 ppm

Fuel Tests

Free/visible water

- Causes rust, microbial growth
- Injector/pump wear
- Often a result of poor sampling
- Often a result of deliberate contamination i.e. fuel theft

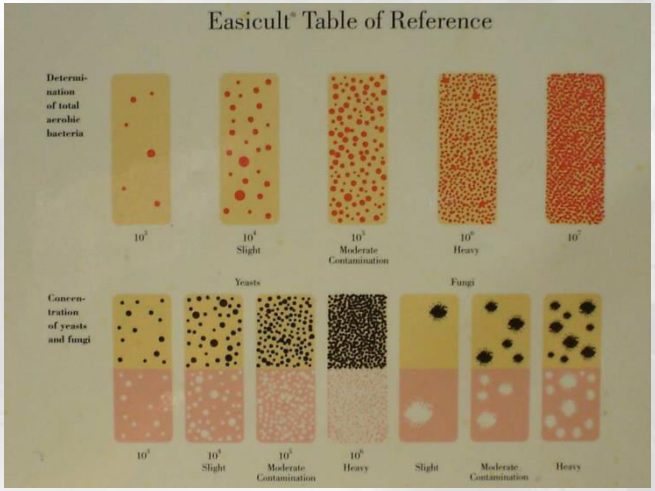
Fuel Tests

Illuminating paraffin (IP)

- Reduced lubricity to pumps and injectors
- Illegal, harsh penalties
- Can test absence or presence (0.5%)

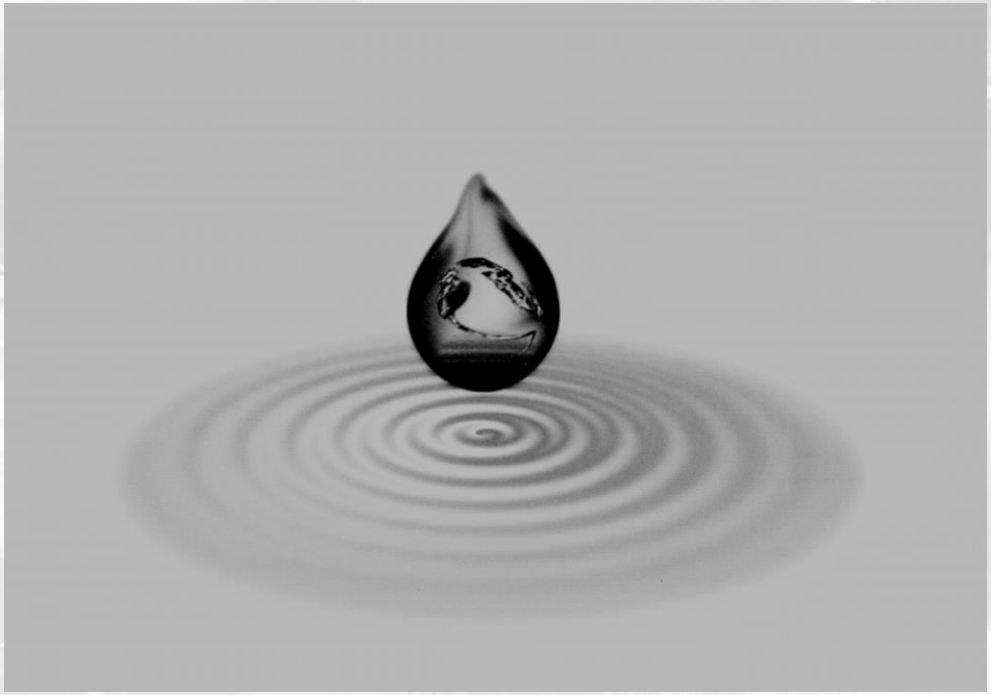
Fuel Tests

Bacterial Testing

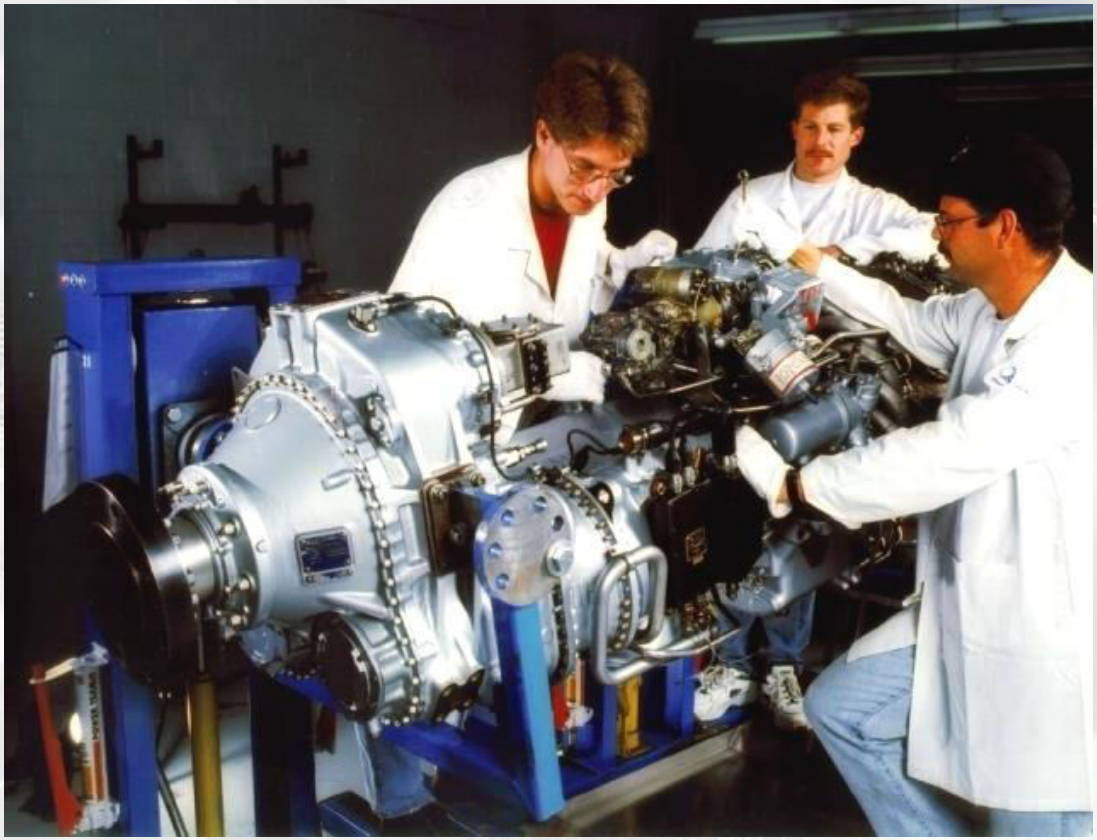


- Blocks up filters
- Caused by long storage time, water content

Why We Analyse Fuel



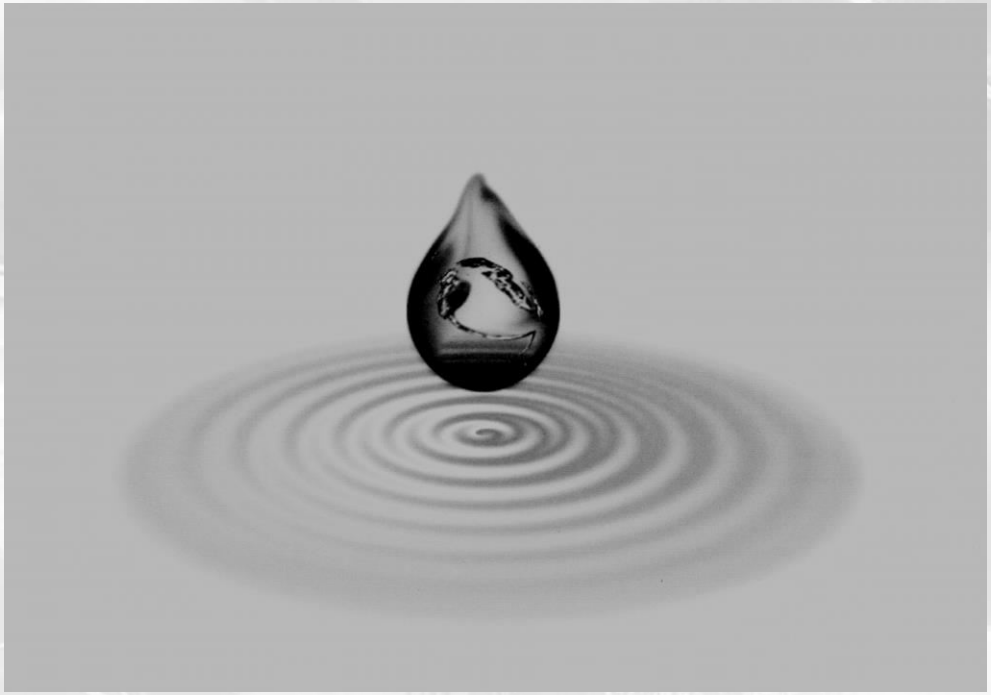
Avoiding Unnecessary Overhauls



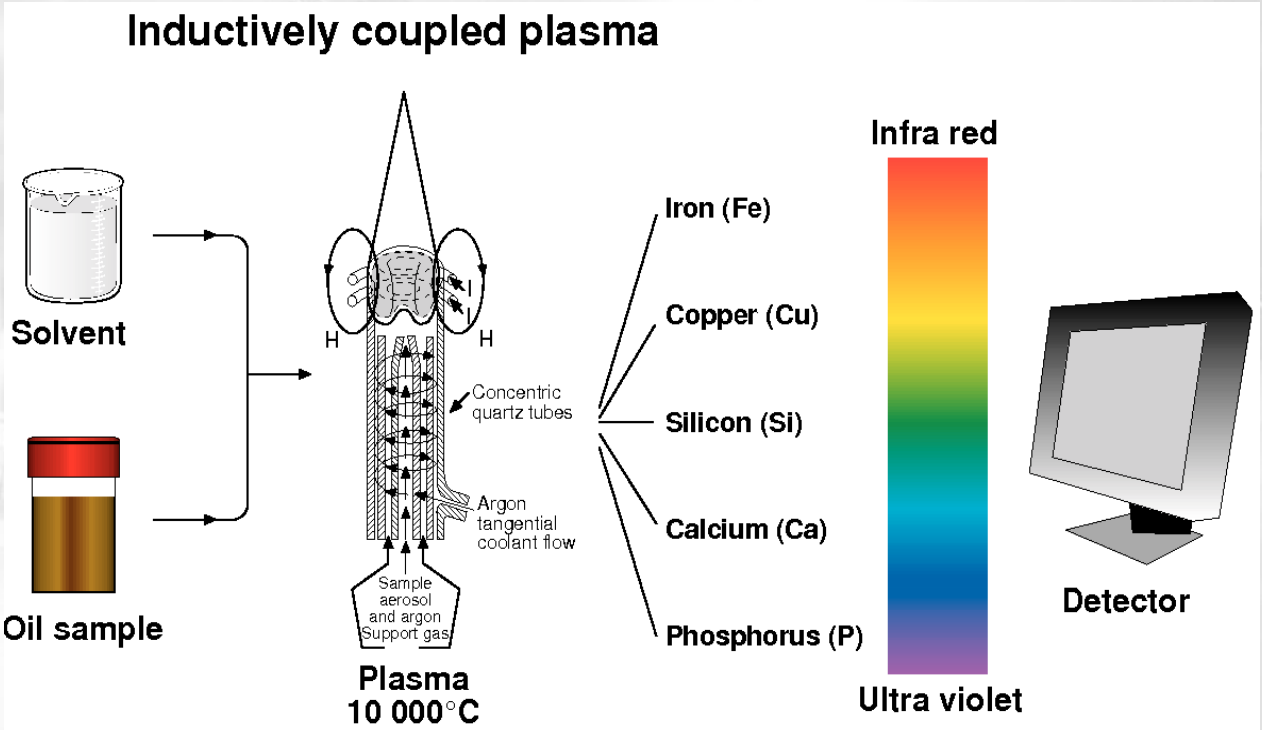
Avoiding Production Loss

...and Making MONEY!

Lubricant Tests



Elemental Analysis



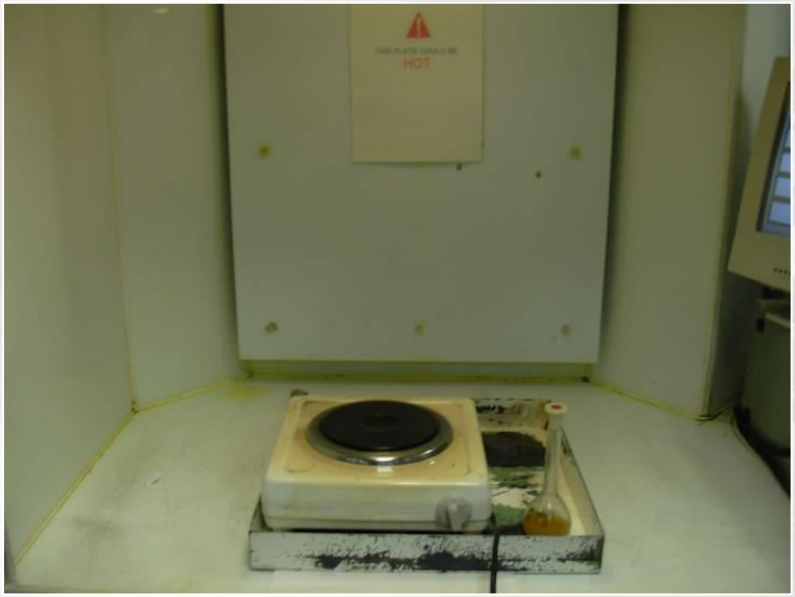
At very high temperatures different chemical elements (atoms) radiate light of different frequencies (colours). A detector can see these 'colours' and the strength of the light is proportional to the amount of the element present.

Ferrous Density

Kinematic Viscosity

Moisture Detection

Engines



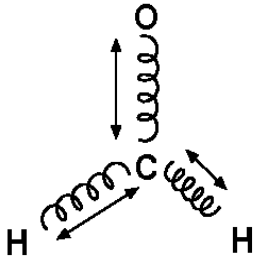
Everything else, except transformers and refrigeration compressors

Moisture Quantification

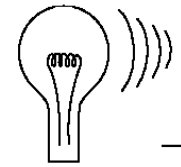
All components except…

…Transformers and refrigeration compressors

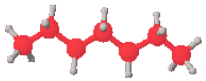
FT-IR Spectroscopy



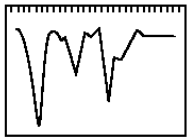
Atoms are held together by chemical bonds. These bonds are like springs and they vibrate.



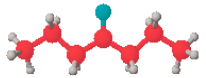
Infrared (heat) radiation



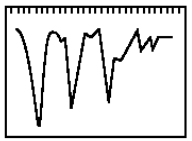
New oil

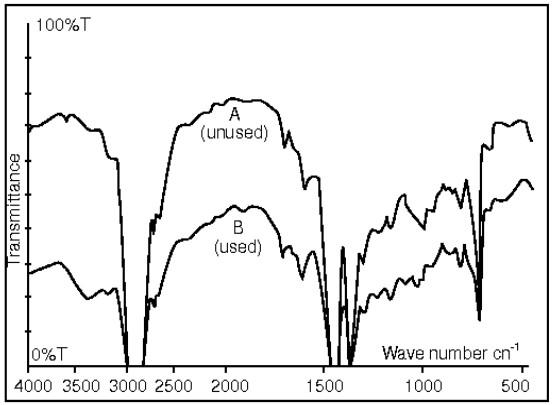


Infra red spectra



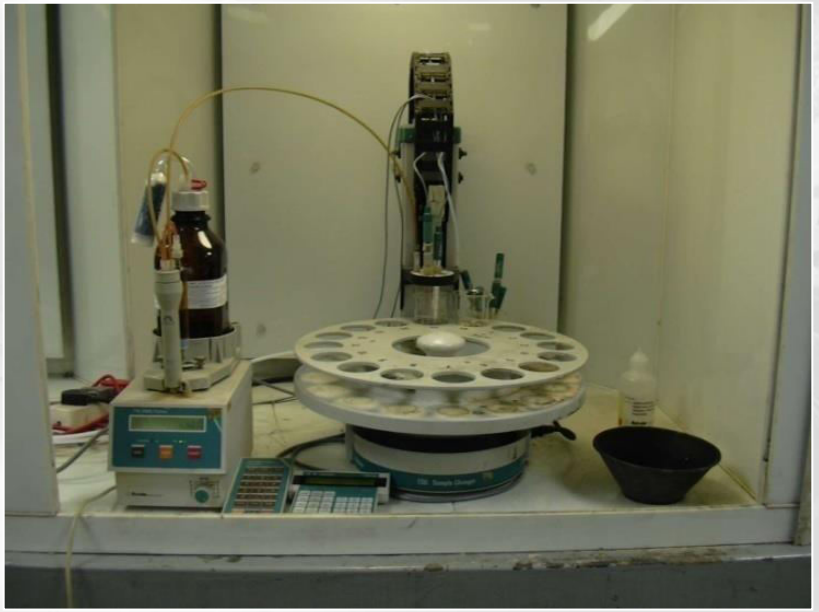
Used oil





Different molecules absorb infra red radiation at different frequencies. Each compound has a unique fingerprint. The new oil spectrum is subtracted from the used oil.

Titrations (TAN and TBN)



Gas Chromatography

Debris Analysis