



Introduction

“Coke” is the solid residue remaining when oils undergo severe oxidative and thermal breakdown at extreme engine temperatures. The higher the temperature, the harder, blacker and more brittle the residue.

The coking performance of individual oils varies with the oil formulation and with the engine environmental conditions in the coking zone. The environmental conditions influencing the physical condition of the oil in the coking zone also dictate the morphology of the coke deposit and the amount formed.

Coke Deposits

Deposits are not desirable, but if they do form, you want them to stay where they are. Coke shedding can cause blockage of filters and engine oil system passageways. Shedding is influenced by engine thermal cycles and by absorption of moisture during prolonged shut down periods. Additionally, cracking, crazing or lifting of deposits from formation surfaces causes more oil to be trapped and greater amounts of coke to be formed. This also has an influence on the morphology of the coke.

Classification of deposits in line with formation conditions and morphology has been suggested. Four important examples are suggested in the chart titled Coking Classification.

It should be noted that some oils which are superior under one set of conditions can perform badly under others.

Coking Classification

THIN FILM:

Forms from high surface to volume ration of oil films.

Has short coking residence time.

Deposits in layers with engine cycles.

Has a shiny, smooth surface appearance, with “spikes” when formed in high centrifugal force areas.

Can shed or curl back to leave clean surfaces.

MIST/VAPOR:

Forms due to inadequate wall washing/cooling effects.

Coking residence time variable with air/oil ratios.

Can have matte surface appearance with many irregularities.

Can shed fragments in many different sizes.

PUDDLES:

Forms from high surface to volume ration of oil layers.

Has long coking residence time.

Deposits form in thick chunks.

Surface varies from shiny to matte with a lava-like appearance.

Can shed in lumps or large particles to leave clean surface.

DYNAMIC:

Forms inside oil distribution pipework often in area of change in size or direction (behind obstructions or bends in the pipes).

Surface appearance varies and can include growth in columns oriented to the direction of oil flow.

Can shed in variably sized lumps.

Can continue to form after shutdown in conducted or convected heat.