An experienced observer can recognize whether the sample is typical of the product and the type of service. A clear, bright sample contains neither free water, nor significant amounts of sediment. On the other hand, a hazy, cloudy, or opaque coil contains suspended contaminants, of which water is one of the most common.

Olfactory examination can also provide useful information. Severely degraded lubricants have a characteristic pungent odor, which can be discerned, even by the untrained. A burnt odor indicates local or severe overheating and suggests possible “hot spots” in the system, even though the condition of the oil is not seriously affected otherwise. Odors described as distillate, kerosene, gasoline, chlorinated solvent, sour, or sulfurous offer obvious evidence of contamination by foreign materials.

The following chart is typical guidelines for sampling:

UNIT TYPE	**RECOMMENDED SAMPLING FREQUENCY**
GEARS	bi-monthly (1000 hours)
HYDRAULICS	bi-monthly (1000 hours)
RECIPROCATING COMPRESSORS	monthly (750 to 1000 hours)
ROTARY COMPRESSORS	monthly (750 to 1000 hours)
MACHINING COOLANTS	weekly check of pH and bacteria/fungi which can be done in -house

KEYSTONE LABORATORY CAPABILITIES:

Lubricant Analysis Tests:

Viscosity @ 100ºF, @ 210ºF, @ 100ºC, or @ 40ºC	ASTM D 445
Viscosity Index	ASTM D 445
Water Content	Karl Fisher Method
Solid (Sediment) Content	Vacuum filtrations
Total Acid Number	ASTM D 974
Spectrochemical analysis	Atomic Emission
Grease Analysis Tests:	
Penetration, worked, @ 77ºF	ASTM D 217 D 1401
Dropping Point, ºF	ASTM D 2265
Spectrochemical analysis	Atomic Emission
Coolant Analysis Test:	
pH	pH meter
Dilution Ratio	Refractometer, or evaporation
Bacteria/Fungi	Cultures

VISCOSITY:

Viscosity is a lubricant's internal resistance to flow at a given temperature in relation to time. This test is considered to be the single most important physical property of a lubricant. Changes in viscosity indicate improper servicing, dilution, contamination, or lubricant breakdown in service. Viscosity is usually determined with a kinematic method and the results are reported in centistokes (cSt), or Saybolt Universal Seconds (SUS).

Viscosity can also be classified into different grades. Two such grades are ISO viscosity grade, which is based on the fluid's viscosity at 40ºC in centistokes (cSt), and SAE viscosity grade, which is based on the fluid's viscosity at 210ºF in Saybolt Universal Seconds (SUS). Other grades are also used such as AGMA for gear lubricants.

WATER:

The presence of water in a non-water-based fluid indicates contamination from an outside source or from condensation. Excessive levels of water promote lubricant breakdown and component part corrosion. Results are normally reported in % volume, or parts per million (ppm).

SOLIDS:

This is a measurement of the overall amount of fuel soot, varnish, sludge, and/or other insoluble materials present in the used lubricant. The results are centrifuged out and are reported in % volume. Another method determines the amount of filterable solid material in the sample with particle sizes greater than the filter pore size specified for the test. The test is performed by vacuum filtration, and is normally expressed as a weight percentage.

TOTAL ACID NUMBER:

Measures the total amount of acidic material present in the lubricant. Generally, an increase in TAN above that of new product indicates oil oxidation or contamination with an acidic product. The results are expressed as a number value corresponding to the amount of the alkaline chemical potassium hydroxide required to neutralize the acid in one gram of sample.

SPECTROCHEMICAL ANALYSIS:

Selected metallic elements present as microscopic particles suspended in the fluid to be analyzed are identified and measured in parts per million (ppm) by weight. They can be identified as three main categories: Wear metals; result from adhesive, abrasive, fatigue, corrosive, and cavitation wear, Contaminants: substances entering a component's oil system from an outside source, and Additives: chemical compounds added to oils to impart specific beneficial properties to fluid. When this test is used for greases, it is not as accurate as it would be for fluids.

PENETRATION:

This test determines the consistency of a grease, which is defined as its resistance to deformation under an applied force. In other words, its relative stiffness or hardness.

It is measured by as a weighted cone, which sinks into the surface of the grease. The depth of the cone is called the penetration and is measured in tenths of millimeters. The softer the grease, the more the depth, the higher the penetration.