

# Analyze, monitor, improve



# No one knows large engines like we do



Everlence is the world's leading manufacturer of large low and medium speed engines. Our experience dates back to the invention of the diesel engine which was over a century ago.

PrimeServ Lab allows you to benefit from this incomparable expertise. It offers a simple, fast and effective way to monitor fluid quality – ensuring safe and reliable engine operation.

# Full scope modular analysis



High availability and reliability are crucial factors for every engine operator. PrimeServ Lab is our remarkable monitoring service for stationary and marine engine fluids. We support you to ensure your engine fluids meet all relevant specifications to perform at its best.

By performing a thorough, professional analysis, our experts are able to identify potential problems, such as a faulty separator or contaminated fuel, that could be damaging your engine. This goes far beyond quick and informal tests. With our help, you can resolve problems promptly – extending your engine's life as well as preventing major difficulties further down the line.

All you have to do is provide us with samples of your engine operating fluids, and our professionals will take care of the rest. What's more, you can select the services that meet your needs, from our comprehensive range of tests.

#### Key benefits

- High availability and reliability
- Maximum component lifetime
- Damage prevention
- Substandard fluid detection
- Specific recommendations
- Fluid optimization
- Customer friendly
- Modular service



# Prevention is better than repairing



With PrimeServ Lab, Everllence experts can identify potential problems before they become major issues.

Each Everllence analysis includes reliable methods in a laboratory environment – they are much more than quick informal tests. These rigorous procedures address all aspects of fluid quality in detail, meaning that potential problems will not go unnoticed.

Within a short space of time, we will send you a detailed inspection report. This will explain any issues and, where required, recommend possible improvements.

All you need to do is send us a sample of your engine operating fluids, using the containers provided in your PrimeServ Lab kit. In our laboratory, Everllence specialists perform a thorough analysis of all your operating fluids.

## Special features

Our service exceeds the scope of a normal analysis, as it includes unique investigation such as:

- Checking for contaminants in fuel oil
- Checking for contamination of lube oil by heavy fuel oil
- Evaluation of the effectiveness of fuel and lube oil separators
- Analysis of cooling water quality

“The Everllence experts have helped us to prevent failures, avoid losses of equipment and profit by detecting several irregularities in the past.”

## PrimeServ ASSIST

### The perfect match

Our proactive service solution PrimeServ Assist is the perfect add-on to PrimeServ Lab and can be a key factor for early diagnostics and preventative maintenance.

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Verny Rojas Vasquez,  
Plant Manager at ICE Power Plant Garabito

# Three vital fluids for your engine's lifecycle



## 20+

years of experience in chemical  
monitoring of engines

## 8,000+

analysed samples per year

## > 1 mio.

kw under PrimeServ Lab contract

Fuel, lube oil and cooling water have a significant impact on engine operation. With the stringent quality control provided by PrimeServ Lab, you can be assured that these vital operating fluids and your engine will be performing at their best with the strict quality control provided by our PrimeServ Lab.

For an engine to operate safely and reliably, all operating fluids need to fulfil strict quality criteria. Using fluids that do not meet the engine manufacturer's specifications can be quite costly. Not only can this reduce the functional life of its components, it can even pose serious safety risks.

### The benefits of PrimeServ Lab

- High availability and reliability by using the appropriate, high-quality engine operating fluids.
- Maximum component lifetime delivering the best possible ROI.
- Prevention of damage saving repair costs and avoiding downtime.
- Detection of substandard fluids as well as contamination of either fuel or oil.
- Specific recommendations based on the test results, and Everllence extensive service experience.
- Optimized setup of operating fluids, which results in performance and cost optimization.
- Customer friendly with a wide range of tests to choose from as well as the option to include them in our service agreements.
- Modular service to guarantee flexibility and the best possible result to match your needs.

# Module 1

## Comprehensive fuel analysis

This module addresses all relevant characteristics to ensure compliance with Everllence fuel specifications. The scope of this module has, to a large extent, been derived from ISO 8217. Compliance with this specification is the essential basis for a reliable engine operation.



### Contaminants

Some fuel contaminants are explicitly listed in the fuel specification. Water and cat fines are acceptable up to a certain level, since they are removed during fuel treatment. Blending of lube oil waste into heavy fuel use to be practiced in the past but is now strictly forbidden due to the damage it causes to engines.

### Non-specified contaminants

Cases are known where fuel contaminants not addressed in a standard analysis have caused major operational problems or even severe engine damage.

In addition to a table listing the standard characteristics, a good fuel purchase specification should include a clause, explicitly prohibiting fuel contamination with harmful components.

For example: "The fuel must be homogeneous blends of hydrocarbons derived from petroleum refining. The fuel must be free from inorganic acids and used lubricating oils. The fuel must not include any added substances or chemical waste which could jeopardise plant safety, adversely affect the performance of machinery, be harmful to personnel, or overall contribute to additional air pollution."

### Energy content

Nowadays, fuel specifications categorise fuel according to their viscosity. However, in a number of cases, this has no correlation to the quality, content or energy. This can result in low energy fuel being sold at the higher price of high energy fuel. The difference in energy content can result in more than 5 % more fuel consumption.

In order to incorporate the calorific value of fuel purchasing, a reliable determination of this value is required. Since formulas to calculate the calorific value of other fuel characteristics are only estimates, we measure the calorific value using a calorimeter.

### Fuel stability

Since the introduction of low sulphur fluids, the number of issues regarding instability or incompatibility have increased. PrimeServ Lab measures the p-value of fuel, which is the most reliable and advanced way of testing fuel stability and compatibility.

### Scope of Module 1

- Viscosity at 50°C
- Density
- Water content
- Carbon residue
- Asphaltene content
- Elemental analysis CHN
- Sulphur content
- Cat fines content (Al+Si)
- Contamination with lube oil (Ca, Zn, P)
- Na, Ni, V, Fe content
- Ash content
- Flash point
- Calorific value (measured)
- FT-IR screening for chemical waste
- Acid number
- p-value

**The scope of this module can be adapted for diesel oil or biofuel samples.**

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# Module 2

## Fuel separator control samples

Fuel often contains a high proportion of very abrasive particles (e. g. cat fines, rust, sand, iron) and water (often corrosive) that must be eliminated from the fuel in order to avoid severe abrasion in the fuel system and combustion chamber. A regular survey to determine if the fuel separator is working properly is essential, especially when fuels containing cat fines are in use.



### Separator efficiency

The effective reduction of water and cat fines by separation is the clearest proof of optimum separator performance. However, this method cannot be applied, if the fuel does not contain cat fines, or most of the cat fines are very small in size. The Everllence particle determination method offers a more comprehensive picture and enables an accurate evaluation of separator efficiency in such cases.

### Scope of Module 2

- One sample before and one after separation
- Water content
- Cat fines content (Al+Si)
- Partical contamination

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**Table 1: Example of optimum fuel separator performance**

Parameter	Before separation	After separation
Water content	0.13 %	0.10 %
Al+Si content	31 mg/kg	< 10 mg/kg
Particles	many	few
Particles size	mainly 10 – 40 µm	mainly < 10 µm

# Module 3

## Lube oil analysis

While standard laboratories can merely analyze the quality of lube oil, Everllence puts the results into context with the engine and the other engine fluids. This gives us the advantage of making it possible to supply our partners with detailed recommendations for improvement.



### Knowing what's best

Everllence engines do not have defined oil change intervals. Instead, analyses of the lubricant conditions are carried out at regular intervals. As long as the lubricant's characteristics are within certain limits, no oil changes are required.

If one or more characteristics are not within the specification limits, remedial measures must be implemented to avoid damage to the equipment. Such measures can be a change of oil brand, or a partial – or even complete – oil change.

By knowing the quality of the fuel in use, we are able to recommend the most suitable oil type for your engine and your application.

### Fuel contamination

All engine oils are contaminated with fuel or fuel components. Because of the low oil consumption of modern engines, these contaminants accumulate in the oil. Excessive fuel contamination can cause both black sludge and piston undercrown deposits.

Everllence has developed a method for determining heavy fuel contamination in lube oil. This method can even determine the source and mechanism of contamination (i.e. via fuel pumps or via combustion chamber).

### Scope of Module 3

- Viscosity at 40°C
- Base number
- Water content
- Insolubles
- ICP: Mg, Ba, Zn, P, B, Na, Ni, V, Al, Si, Fe, Cr, Cu, Pb, Sn
- FT-IR: oxidation, soot content
- Fuel contamination: asphaltene content and in case of contamination as well the cause of contamination
- Magnetic particles

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# Module 4

## Lube oil separator control samples

Proper operation of the lube oil separator is essential for maintaining good lubricant quality and good wear control.



### Beyond standard

Many customers take a standard lube oil analysis by using samples, which are taken either before or after the separator. However, this does not give any indication as to whether the separator is functioning well, and if it is actually cleaning the oil, since the standard analysis does not include the measurement of particles. Although the parameter (characteristic value) of insolubles claims to measure particles, this type of oil degradation product measurement cannot actually give a qualified statement with regards to the purity of the lube oil. Only a minimal part of these measured insolubles are actually particles.

### Scope of Module 4

- One sample before and one after separation
- Water content
- Contamination with particles

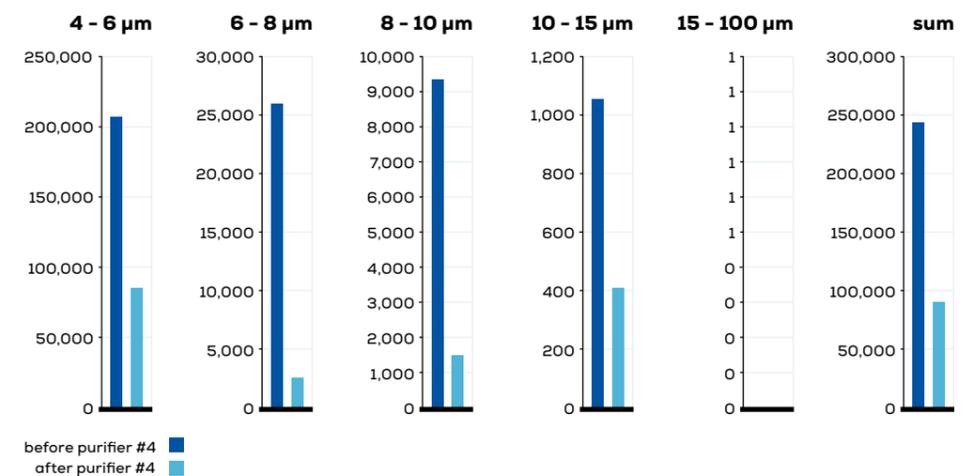
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### Two methods for better results

Everllence has developed two methods for the qualitative and quantitative determination of particle contamination, that enables an assessment of separator performance to be made. One method is based on filtration and evaluation of the particles as illustrated above. The second method is based on an optical particle counting. The level of contamination defines which method is applicable.

### Particle analysis



# Module 5

## Cooling water (HT, LT, NCW)

Cooling water is a very important operating fluid, but is often neglected – even though a poor coolant condition can cause significant additional maintenance costs.

Proper fresh water quality is very important. The lower the hardness and concentration of salts, the better the quality of the coolant.



### Cooling water quality control

Water hardness causes deposits and high chloride content promotes corrosion. Chemical additives with sufficient concentration must be added to fresh water. The concentration of additives can deplete over time, so additives have to be regularly refilled. Frequent on-site checks with a test kit are important, but should be backed up by regular laboratory validation to verify on-site measurements.

### Scope of Module 5

- pH value
- Water hardness
- Chloride content
- Concentration of corrosion inhibitor
- Sulphate, nitrate content
- Conductivity
- Alkalinity
- Anti-freeze content

### Optional

- Content of corrosion products

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