MACHINERY CONDITION MONITORING, ESTIMATES PEFORMANCE &RELIABILITY WITH RESPECT TO LUBRICATION OIL ANALYSIS

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Abstract: **The Condition monitoring (CM) is a way or method of monitoring the health of the machinery, systems, sub systems and /or associated equipments. Nowadays , It has been addressed as one of the most innovative solutions for anticipating failures in machinery and is being used by a wide variety of industrial sectors. The CM Process can be performed when the equipment is running (online) or not (offline) at regular time intervals (periodically)or Continuously. Thers are many researchers in this field in which the number of models has been proposed , such as the maintenance management system, Maintenance performance measurement, and maintenance performance indicators. Oil analysis technology is the one of the best Tehnique to estimate and analyze the machinery Health condition and performance .**

Oil analysis is the Process of testing, physical and chemical properties of oil and insoluble particles in the oil. This paper main purpose is to lubrication oil condition monitoring and degradation detection is to determine ,whether the oils have deteriorated to such a degree that they no longer fulfill their functions. The machine reliability, focusing on their relationship with overall performance, durability, and availability are depends on proper lubrication. Lubrication oil is an important information source for early machine failure detection just like the role of the human blood sample testing in order to perform disease detection.

Key Words: Condition Monitoring, Oil analysis, Reliability, Performance measurement.

INTRODUCTION:

Miantenance performance measurement consists of monitoring parameters that characterize the state of operation of the equipment. It can be reletes to oil analysis, Ferrography, Thermography and vibration analysis.

Oil analysis is mainly used for checking the condition of oil for lubricating or insulating equipment such as bearing, gearbox, transformer and other electrical distribution equipment.

Oil Condition monitoring can be conducted with oil particle counting and measurements of moistness, viscosity, acidity and temperature.

In modern industries, lubrication oil plays a critical part in condition maintenance of complicated machineries.

In recent years, health condition monitoring and prognostics of lubrication oil has become a significant topic among academia and industry. Significant effort has been put into oil diagnostic and prognostic system development and research.

In comparison with vibration based machine health monitoring techniques, lubrication oil condition monitoring provides approximately 10 times earlier warnings for machine malfunction and failure .

The purpose of most research is, by means of monitoring the oil degradation process, to provide early warning of machine failure and most importantly extend the operational duration of lubrication oil in order to reduce the

frequency of oil changes and therefore reduce maintenance costs.

Machinery Peformance in Terms of Reliability:

The science of reliability has many potential applications in communication and medicine due to global development, particularly in science and technology, and the use of sophisticated and complex systems.

Reliability is the probability of a system performing a particular job for a specific period under the working conditions for which it is designed. It can be evaluated to determine the type and size of production and improve it through engineering designs based on design for maintainability.

Methodology:

Lubricant condition monitoring program

The LCM program entails analysis of lubricants that highlights its changes and/or deterioration which influences the lubrication properties . Moreover, this information is used in maintenance decision making to abate any failure of the system, increase the system availability, reduce unnecessary lubricant replenishment costs, moderate environmental effects and enhance the diagnosis process..

1.Lubricant condition monitoring steps

Lubricant sampling (sample collection):

Lubricant sampling can be classified as dynamic or static, where static involves a discrete sampling event characterized by a fixed state or condition. In this case, a sample is drawn for testing while the equipment is either running or not operational.

Dynamic sampling is characterized by constant changes in state or conditions, for instance, use of on-line and in-line sampling and analysis for testing the lubricant. In the in-line technique, the oil is analyzed while passing between the lubricant pump and the component to be lubricated, whereas on-line technique involves bypassing the oil to the analyzer.

In static sampling, often referred to as off-line analysis, the lubricant sample is drawn out from the machine and analyzed in the laboratory which can be on-site or out of the site. Recent reviews on the sampling methods are given

For accurate maintenance decision making, the integrity of the lubricant sample which is a legitimate representative must be guaranteed. The applicability of the different sampling types may be adopted depending on different dynamics the machinery is running in e.g. for uninterrupted running, on-line sampling may be suitable, though other aspects such as cost and easy usability should be considered. while debri size could use inductive, acoustic or capacitance. Some authors have reviewed the detection types for physiochemical properties , water contamination , and soot contamination , while a comprehensive review of on-line lubricating oil sensors has been Discussed.

EXPERIMENTAL INVESTIGATIONS:

Products Available for Oil Condition Monitoring Systems:

Online Oil monitoring system

Oil condition Sensor

Offline Oil analysis instruments

Online Oil Monitoring System:

Analyses the following simultaneously:

1.6in 1 Sensor

i.Oil Density

ii.Dynamic &KineticViscosity

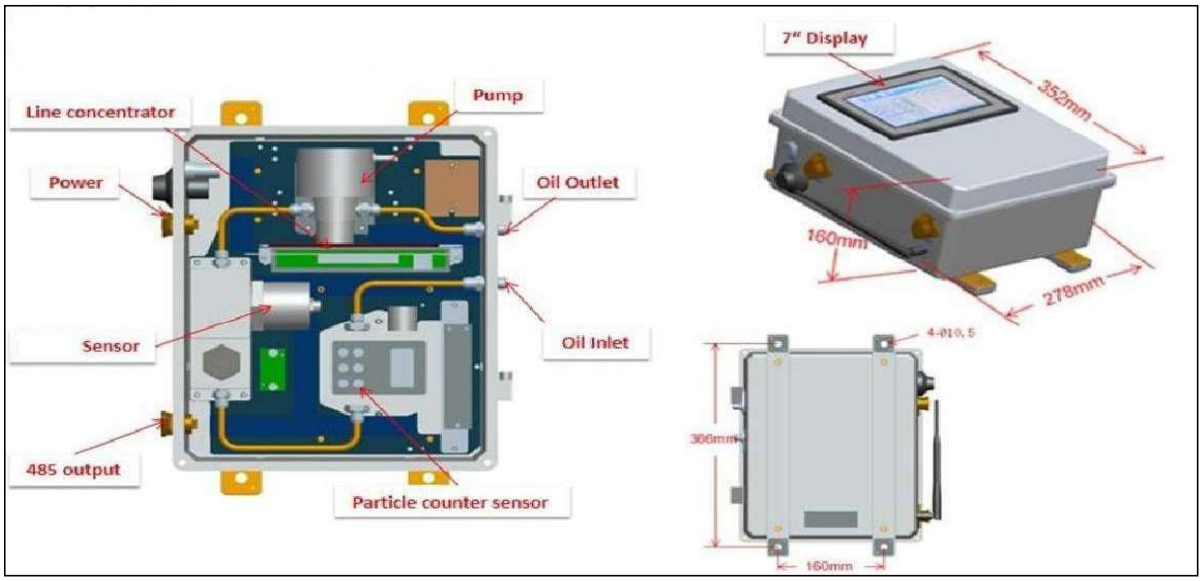
iii.Temperature

iv.Oil Quantity- Dielectric Constant

v.Moisture Content

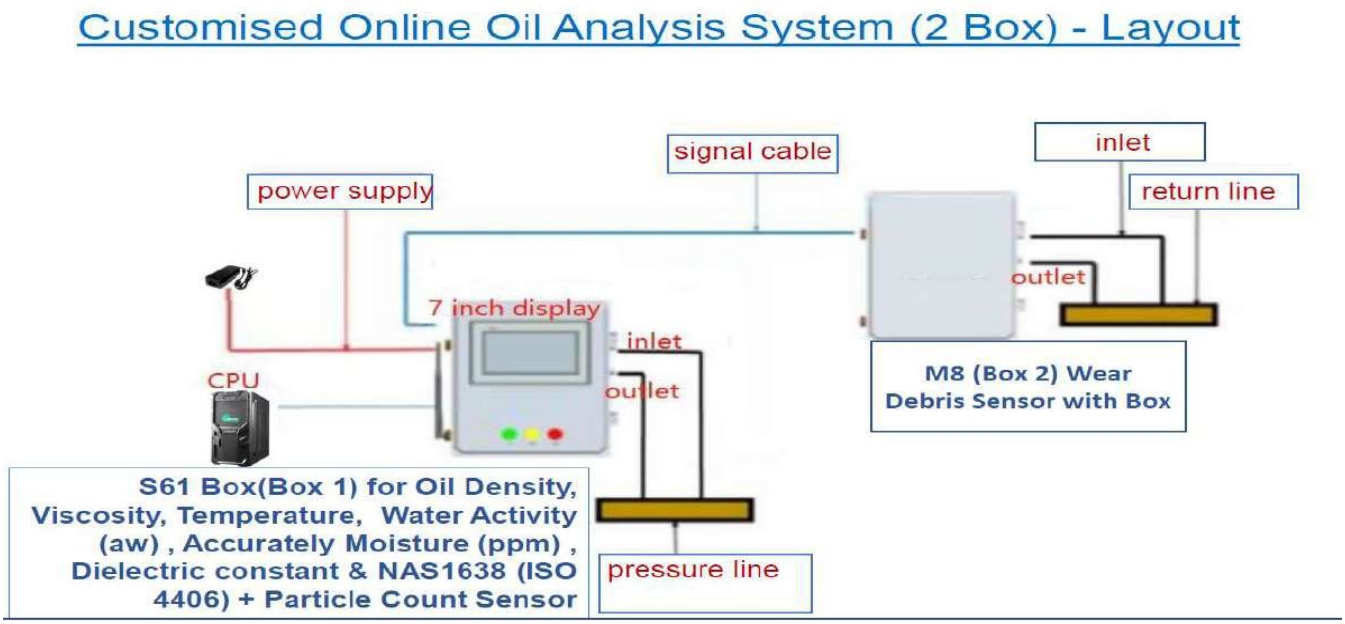
vi.Water Activity

2.Oil Particle Count (Particle Count Sensor)



3.Oil Wear Debris Sensor (Debris analysis Sensor)Layout – Single Box with Local Display

Layout – All sensors on Pressure Line & Wear Debris Sensor on Return Line.



6 in 1 Oil Sensor – Included

Detects

1) Density, 2) Viscosity, 3) Temperature, 4) Water activity (aw) , 5) Accurately Moisture (ppm) and 6) Oil Quality (Dielectric constant)

Details:

1.Density(kg/m³) range: 600 kg/m³~1250 kg/m³ {Accuracy: 2% or 5kg/m³(Take the larger value)}
2.Viscosity(mPa·s): 1~400mPa·s (1-500cSt) {Accuracy: 5% or 1mPa·s(Take the larger value)}
3. Temperature range: 0～100 °C (Accuracy: 0.5℃)
4.Water activity (aw) range: 0～1 aw (Accuracy: 0.03aw)
5.Moisture in oil range: 0-10000 ppm (or customizable testing range) 10ppm(Take the larger value)}
6.Oil Quality(Dielectric constant): 1-6 level (Accuracy: 5%)

Oil Particle Count Sensor- Included:

1.Light Source: semiconductor laser
2.Eight Channels and testing range:1～100μm or 4~70μm(c)
3.Sensitivity:1μm(ISO4402) or 4μm(C) (ISO11171,GB/T18854 -2002)
4.Standards: NAS1638, ISO4406, SAE749D, ГОСТ17216, AS4059D, etc.
5.Particle size: 1μm, 2μm, 5μm, 10μm, 15μm, 25μm, 50μm, 100μm ;
6.Accuracy: ±0.5 pollution level
7.Online pressure: 0.2～10MPa ;
8.Online flow: 50～300mL/min
9.Oil temperature: 0-80℃

Oil Wear Debris Sensor – Included:

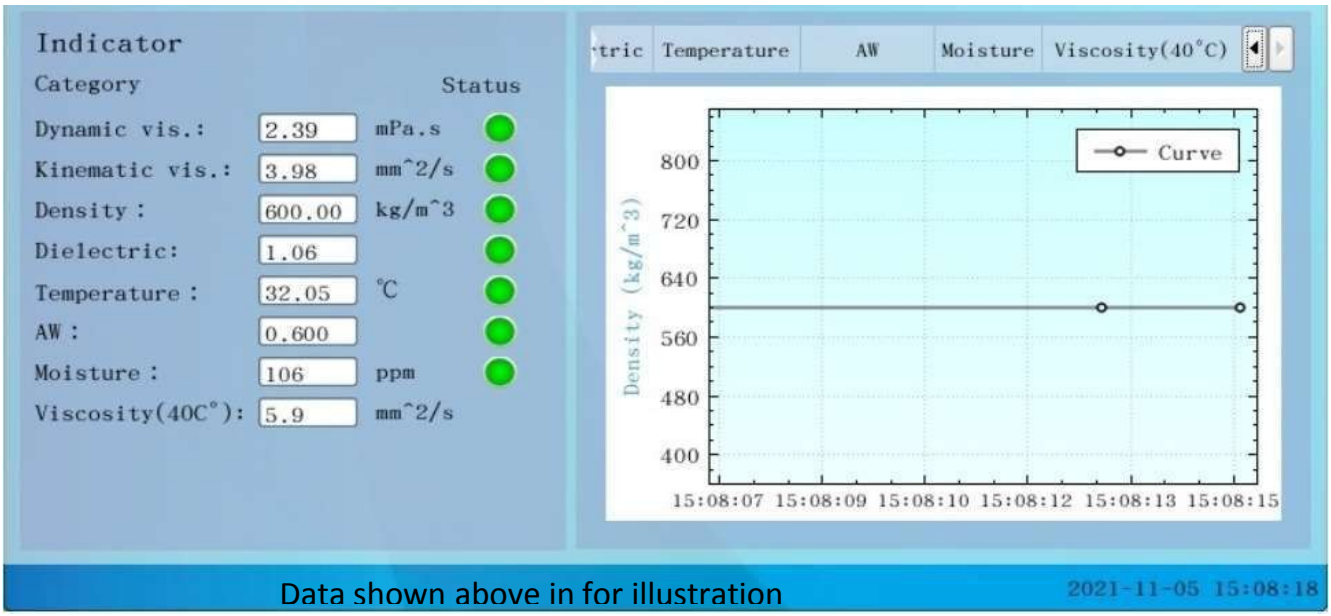
Detects the number of metal particles in Oil Sample

Standard: CE, ASTM1657 and other certification and testing standards

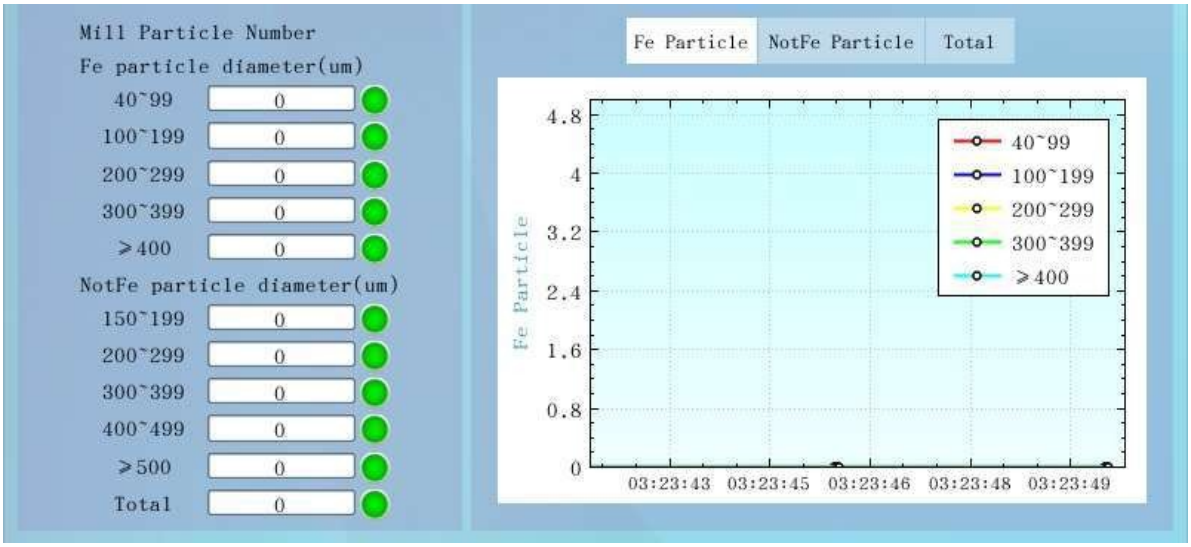
Four Options for FE particles
<100um
100-200um
200-300um
Two options for Non-FE particles
450-600um
>600um
Total wear particles in oil include ferromagnetic & non-ferromagnetic particles

Difference between Moisture in Oil Sensor & Water Activity Sensor

Displaying - All Parameters with Graph



Displaying – Wear Debris Sensor Data with Graph



Results and Disussions:

From the above sample data of oil tested results , various parameters like viscosity, temperatutre, and othe can picturize the degredation change from initial to final. This online sensors data helps to change oil predictions and maintenance stratagies can be improved . Finally ! Reliability and Performance of machinery evaluated and improved by scheduled oil changes .

Conclusion:

The purpose of this paper is to present the development of an online lubrication oil condition monitoring and remaining useful life prediction technique based on a particle filtering and commercially available online sensors.

References:

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