Case Vatajankoski Power – oil performance monitoring

In gas engines, oil performance monitoring can provide significant benefits over traditional sample-based oil performance monitoring

In cooperation with Vatajankoski Power, Fluid Intelligence carried out GE Jenbacher gas engine oil performance monitoring by comparing the traditional model with the Fluid Intelligence's remote oil monitoring solution, Fluid Monitoring. We could verify that remote monitoring of the oil performance with Fluid Monitoring can significantly reduce oil sampling. In addition, there is a continuous knowledge of oil performance development and oil change intervals can be further elaborated by extending the life cycle of oil.

GE Jenbacher gas engines have no fixed change intervals, but oil performance limits have been set to determine whether the oil is fair or interchangeable. For bio- and landfill gas maximum oil sampling interval is 250 operating hours and for natural gas 500 operating hours (reference GE Jenbacher TA 1000-0099B and TA 1000-0099C).

The values to be tracked are among others viscosity at different temperatures, total acid number, total number of strands, nitrite and oxidation values based on IR analysis, soot content, and additive and wear metals. The manufacturer has also set maximum limits for each measured quantity. The values monitored in the Finnish operating environment are quite comprehensive and accurately describe the development of oil performance.

Fluid Monitoring was introduced in connection with oil change and at the same time continued the traditional performance analysis of oil samples. Fluid Monitoring closely monitors the change measured from oil sample analyses. In addition, oil temperature information can be utilized to identify the root causes of potential problems.

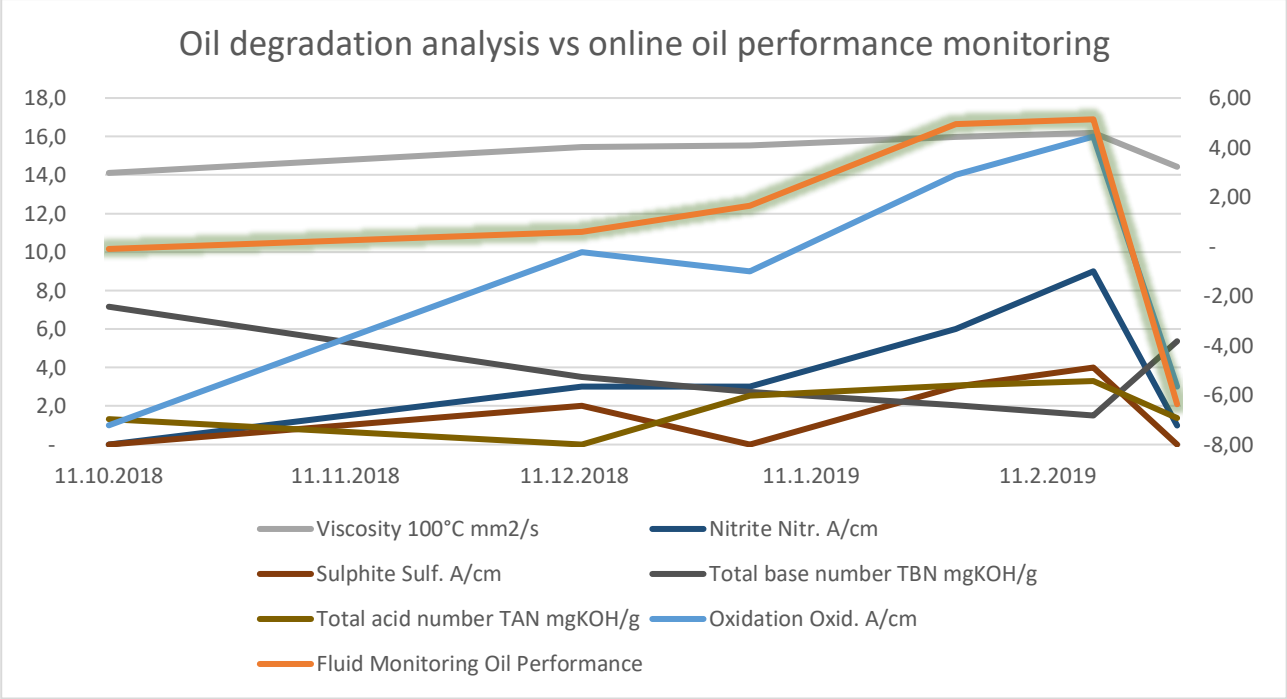

Figure 1 The steady deterioration in oil performance was clearly seen in both samples and remote reading

The characteristics of engine oil include the addition of alkaline additives to the oil to control the formation of oil oxidation products. The wear and tear of these basic products is normal, and when they run out, the formation of oil oxidation products accelerates significantly. The wear of the additives in the oil is generally quite moderate, in this case the wear of the boron known as an anti-wear agent was noticeable.

Remote monitoring of oil performance can reduce unnecessary work and focus attention on critical changes

The remotely located gas engine being monitored is challenging in terms of maintenance, where oil sampling, packing and shipping of samples is a cost factor with its trips and work. Based on the oil samples, the information is also well deferred, so that it is not possible to intervene in time for rapidly evolving challenges before they escalate into serious threats to the reliability of use. The Fluid Monitoring solution provides a tool to monitor the performance of oil performance in real-time and accurately predict the next oil change required.

The oil change interval can be significantly extended by interfering with proven oil performance factors. Although the cost of purchasing new oil as such is not significant, as measured by the value of the new oil, the 50% increase in the replacement rate will bring back the costs of monitoring. In addition, the benefits of increased operational reliability are significant.

CUSTOMER BENEFITS:

- No need for monthly oil samples
- Increased oil change interval without risk
- Enables more accurate service anticipation and planning
- Better view of hardware usage and performance
- The amount of waste oil generated will decrease significantly

INSTALLATION LOCATION

Figure 2 Sensor installation is in the return line. Note that when engine is shut down, the line is empty and the Fluid Monitoring values decrease to negative numbers.

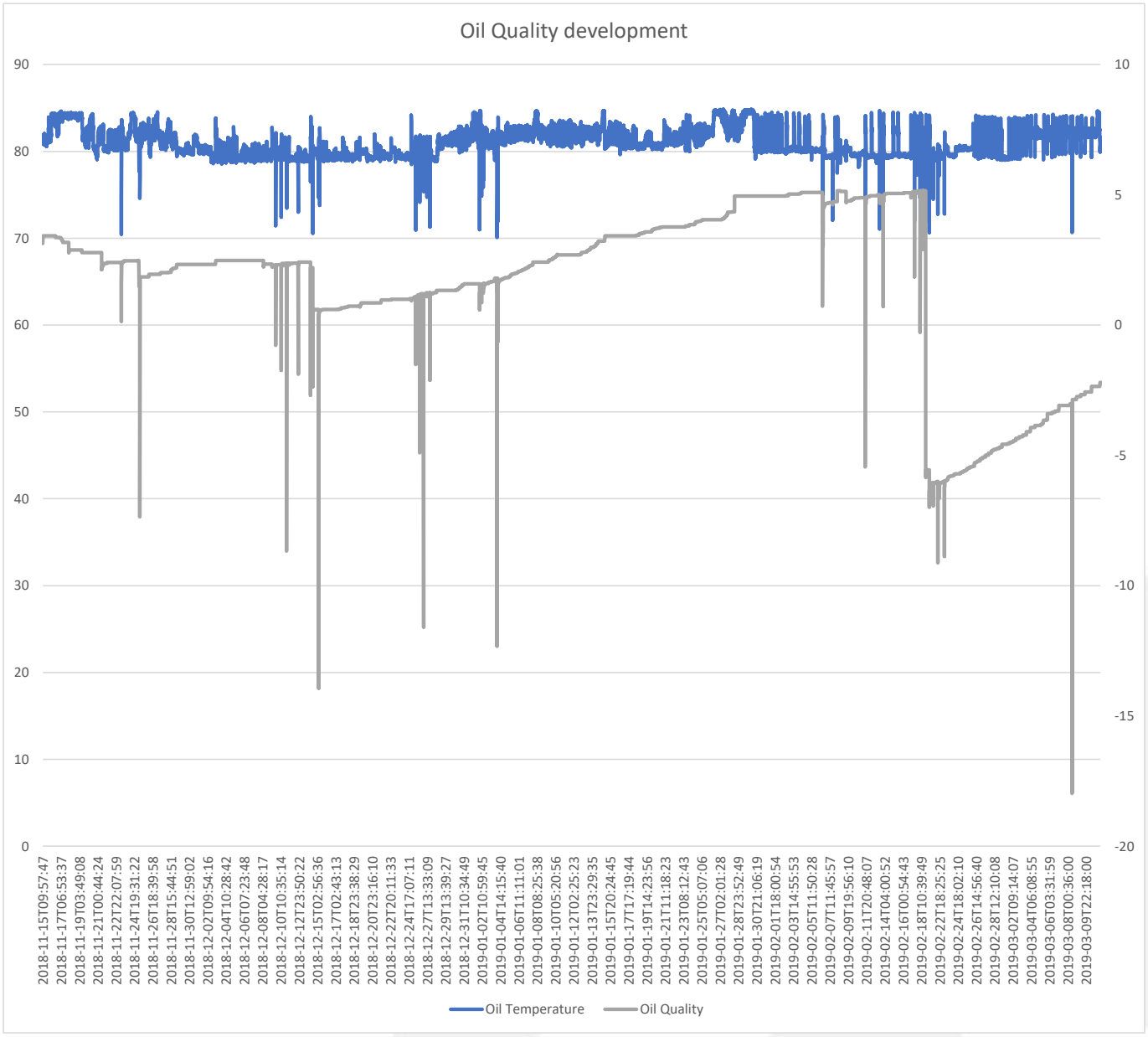

Figure 3 Oil quality development during norma usage. Note that spikes down are engine shutdown and oil sensor is in the empty pipe.

OIL SAMPLING DATA

Engine: GE Jenbacher Gas Engine
Oil: Mobil Pegasus 605 Ultra

Date of sampling			28.2.2019	17.2.2019	30.1.2019	3.1.2019	12.12.2018	Fresh oil 11.10.2018	Alarm limit TA 1000-0099B
Viscosity	*40°C*	*mm2/s*	129	153	151	144	143	125,5	≥ 157
Viscosity	*100°C*	*mm2/s*	14,4	16,2	16,0	15,5	15,5	14,1	≥ 17
Viscosity-index			111	111	110	111	111	111	
Water	*KF*	*%*	0	0	0	0	0	0,1	≥ 0,2
iron	*Fe*	*ppm (mg/kg)*	1	2	2	2	2	0	≥ 20
Chrome	*Cr*	*ppm (mg/kg)*	-	-	-	-	-	0	≥ 5
tin	*Sn*	*ppm (mg/kg)*	-	-	-	-	-	0	≥ 5
Aluminium	*Al*	*ppm (mg/kg)*	-	-	-	-	-	0	
Nickel	*Ni*	*ppm (mg/kg)*	-	-	1	-	-	0	
Copper	*Cu*	*ppm (mg/kg)*	-	-	-	-	-	0	≥ 15
Lead	*Pb*	*ppm (mg/kg)*	-	-	-	-	-	0	≥ 20
Molybdenium	*Mo*	*ppm (mg/kg)*	-	-	-	-	-	0	
Silver	*Ag*	*ppm (mg/kg)*	-	-	-	-	-	0	
Silicone	*Si*	*ppm (mg/kg)*	-	-	1	1	1	2	≥ 20
Potassium	*K*	*ppm (mg/kg)*	-	1	-	1	-	0	≥ 5
Natrium	*Na*	*ppm (mg/kg)*	-	1	-	-	-	1	≥ 20
Calsium	*Ca*	*ppm (mg/kg)*	1 440	1 700	1 717	1 581	1 671	1442	*trend*
Magnesium	*Mg*	*ppm (mg/kg)*	4	4	4	4	4	4	*trend*
Boron	*B*	*ppm (mg/kg)*	157	45	47	50	57	188	*trend*
Zinc	*Zn*	*ppm (mg/kg)*	563	645	615	584	603	528	*trend*
Phosphorus	*P*	*ppm (mg/kg)*	451	430	431	408	419	444	*trend*
Barium	*Ba*	*ppm (mg/kg)*	-	-	-	-	-	0	*trend*
Sulfur	*S*	*ppm (mg/kg)*	3 021	3 125	3 151	2 879	2 849	2943	*trend*
Chlorium	*Cl*	*ppm (mg/kg)*	65	63	79	94	66	81	*trend*
IR Glycol		*%*	-	-	-	-	-	0	≥ 0.02
Oxidation	*Oxid.*	*A/cm*	3,00	16,00	14,00	9,00	10,00	1	≥ 20
Nitrite	*Nitr.*	*A/cm*	1,00	9,00	6,00	3,00	3,00	0	≥ 20
Sulphite	*Sulf.*	*A/cm*	-	4,00	3,00	-	2,00	0	
Total base number	*TBN*	*mgKOH/g*	5,37	1,51	2,03	2,73	3,51	7,16	≤ 3.58
Total acid number	*TAN*	*mgKOH/g*	1,37	3,30	3,07	2,54	-	1,31	≥ 3.81
Acidity	*i pH*		-	-	4,63	5,02	4,66	7,33	≤ 4
Soot content		*%*	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	≥ 2
Fluid Monitoring Oil Performance		**-**	**6,37**	**5,14**	**4,95**	**1,65**	**0,60**	**-0,1**	**<7**