

Lubricant Composition for e-Axle applications

TECHNICAL FIELD:

The present invention is related to lubricating oil composition which is useful as a transmission oil with superior noise controlling characteristics and having long drain potential of 50000-60000 km more than the generally observed drain intervals of 30000-40000 kms in Battery operated electric passenger cars (Full BEV) with e-Axle as main drive train device.

BACKGROUND ART:

A transmission system for a vehicle should be suitably configured to deliver improved power transmission efficiency, and improved fuel efficiency. A conventional transmission mechanism may be a manual transmission, a conventional stepped automatic transmission, a continuously variable transmission, a double clutch transmission, or other type of vehicle transmission. Such transmissions are typically used with conventional gasoline or diesel engine systems. By contrast, electric vehicles are equipped with a motor, an inverter, and a reducer which essentially called E axle. In Electric Vehicle (EV) and Hybrid Electric Vehicle (HEV) vehicles, lubricating fluids may be in contact or not in contact with the parts of the electric motors depending on the vehicle architecture. The advantage of EV vehicles is that it has the ability to generate maximum torque even at zero. Contrary to this, ICE generates the same torque at much higher speeds (rpm). Maintaining lubrication under no rotation is a big challenge, because lubricant can drain off the surfaces while they are stationary, leaving them unprotected which could lead to wear issues. Low temperature lubrication is another issue because conventional anti-wear additives in lubricants require high temperatures before they become chemically active. Copper is present in the electric systems of electric vehicle powertrains and requires corrosion protection at high temperatures. Gear sets, typically of planetary type and fabricated from ferrous alloys and steels, are used in electric vehicle powertrains and also require good protection. Suitable lubricant compositions, however, may use sulfur-containing performance additives in achieving efficient load carrying performance particularly at high temperatures, which may compromise copper metal protection.

Noise, vibration and harshness (NVH) is another increasingly important parameter for all vehicles especially EV vehicles as a result of demands for increasing vehicle refinement. Lubricant characteristics should be refined to the extent to manifest desired vehicle performance and controlled NVH. Therefore, a synergistic approach is indispensable in the design process of a new lubricant. Accordingly, a balance between the concentrations of various components to achieve good oxidation stability, and load carrying ability, corrosion inhibition, over a wide range of operational conditions is required. If this balance is not achieved there can be “alarming gaps” at certain temperatures where individual additives may seem to be competing with each other for reactivity with the metal surfaces they are supposed to be protecting.

EP 2650 348B1 describe lubricating oil composition, in particular, dispersant and detergent additive type and chemistry to obtain an electrical conductivity from 300 pS/m to 1700 pS/m as measured at 22 °C.

JP-2016194002 provides a lubrication oil composition for an electric vehicle or hybrid vehicle which is excellent in gear characteristics, cooling performance and electrical insulation simultaneously.

WO 2018/067902 A1 deals with lubricating oils and methods for producing lubricating oils for electric vehicle power train and their components.

US 2018/0079990 A1 covers a lubricating oil for electric or hybrid vehicle of this invention can also satisfy gear, clutch, cooling and electric insulating properties.

JP-2017020045 A relates dispersant additive in combination with metallic detergent is effective to provide 300-1700 pS/m.

WO 2018/067906 A1 narrates methods for controlling electrical conductivity of lubricant oil by using conductivity promoters and inhibitors.

WO 2018/067905 A1 deals with methods for obtaining desired conductivity to dielectric

constant ratio of lubricating oil and methods for preventing or minimizing electrostatic discharge.

However, none of these documents disclose or suggest lubrication of e-Axle which focuses on reducing the noise characteristics and establishing the drain period via laboratory performance tests and vehicle testing as defined in the present invention.

OBJECTIVE:

It is the primary objective of this invention to provide a lubricating oil composition useful as a transmission oil with superior noise controlling characteristics and having long drain potential of 50000-60000 km, more than generally observed drain intervals of 30000-40000 km, in Battery operated electric passenger cars (Full BEV) with e-Axle as main drive train device.

The further objective of the present invention is that this oil offers these characteristics where a single or double speed or higher speed reduction gear box is used, with integrated motor, electronics and differential units.

Further objective of this invention is to reduce transmission noise by providing excellent lubrication, superior film thickness coupled with optimum traction, better extreme pressure & anti wear performance in the battery electric vehicle.

SUMMARY OF THE INVENTION:

Currently oil drain interval (ODI) of transmission lubricants for electric vehicles are being explored and there is a great desire to have longer ODI generally greater than 25000KM. The lubricant composition of the present invention has the potential of providing ODI greater than 25000KM.

The lubricant composition of the present invention is for e-Axle application where a single or double speed or higher speed reduction gear box is used with integrated motor, electronics and differential units. This type of arrangement is mainly available in full battery electric vehicle (BEV) where drive train noise is a major concern for original transmission manufacturer.

The lubricant composition of the present invention has capability to reduce transmission noise by

providing excellent lubrication, superior film thickness coupled with optimum traction, better extreme pressure & anti wear performance.

The lubricant composition of the present invention has potential to provide NVH reduction without affecting efficiency performance.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings wherein:

Figure-1 illustrates low speed NVH studies: FFT Spectrum –at vehicle speed of 20km per hour in the frequency range of 20Hz-20KHz.

Figure-2 illustrates low speed NVH studies: FFT Spectrum – at vehicle speed of 20km per hour in the frequency range of 20Hz-1KHz(Driver side).

Figure-3 illustrates low speed NVH studies: FFT Spectrum –at vehicle speed of 20km per hour in the frequency range of 20Hz-1KHz(Front passenger side).

Figure-4 illustrates high speed NVH studies: FFT Spectrum –at vehicle speed in the frequency range of 20Hz-20KHz.

Figure-5 illustrates high speed NVH studies: FFT Spectrum –at vehicle speed in the frequency range of 20Hz-1KHz (Driver side).

Figure-6 illustrates high speed NVH studies: FFT Spectrum –at vehicle speed of 80km per hour in the frequency range of 20Hz-1KHz (Front passenger side).

DETAILED DESCRIPTION:

For the purpose of promoting an understanding of the principles of the invention, reference will now be made to the embodiments illustrated in the figures and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated system, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates. Unless otherwise defined, all technical and scientific terms used herein have the same meaning

as commonly understood by one of ordinary skill in the art to which this invention belongs. The system, methods, and examples provided herein are illustrative only and not intended to be limiting.

The terminology and structure employed herein is for describing, teaching and illuminating some embodiments and their specific features and elements and does not limit, restrict or reduce the spirit and scope of the invention.

The following terms will be used throughout the specification and will have the following meaning unless otherwise indicated:

“Viscosity index (VI)” is an arbitrary measure for the change of viscosity with variations in temperature. The lower the VI, the greater the change of viscosity of the oil with temperature and vice versa. It is used to characterize viscosity changes with relation to temperature in lubricating oil.

“Pour point” is the temperature at which it becomes semi solid and loses its flow characteristics.

“Flash Point” is the lowest temperature at which vapours of a fluid will ignite.

“TAN” is a measurement of acidity that is determined by the amount of potassium hydroxide in milligrams that is needed to neutralize the acids in one gram of oil.

“Group I, II, III, IV base oils” are the mineral base oil categories and are defined by the American Petroleum Institute (API) as indicated in below table.

Table: 1

Group	Process	Saturate Level	Sulfur	Viscosity Index
Group I	Solvent Refining	<90%	>0.03%	80-120
Group II	Hydro-processing (Hydrocracking)	≥90%	≤0.03%	80-120
Group III	Severe Hydrocracking (Catalytic De-Waxing)	≥90%	≤0.03%	≥120
Group IV	Chemical Reactions (Synthesizing)	PAOs (poly-Alpha-Olefins)		
Group V	All other not included in Groups I, II, III or IV			

According to the main embodiment of the invention, the present invention provides a novel transmission lubricant composition having unique combination of additives and base oil of suitable viscosity.

Said transmission lubricant composition to reduce noise in e-Axles of electrified platforms, comprises:

- a. a base oil required for necessary film-thickness under high shear conditions, wherein said base oil consists of a primary base oil and a secondary base oil; and
- b. a mix of additive system;

said composition is capable of reducing noise, vibration and harshness (NVH) in next generation Electric Vehicle (EV) propulsion systems of 20,000 rpm.

In another embodiment, said e-Axles are gears, electronics and e-motor.

In yet another embodiment, said base oil is selected from Group (GP) I, GP II, GP III, GP IV and mixture thereof.

In one embodiment, said base oil has viscosity range of 3 - 40cSt at 100°C, Sulphur content of 10-20,000 ppm, hydrocarbon range of 0-10 % (Ca), 60-85 % (Cp), 15-25 % (Cn) and pour point between 0 to -36 °C.

In another embodiment, said primary base oil has viscosity ranging from 3-11 cSt at 100°C and viscosity index value in the range of 100-130.

In yet another embodiment, said secondary base oil has viscosity ranging from 20-40 cSt at 100°C and viscosity index value in the range of 80-95.

In a further, embodiment, said total base oil concentration is ranged from 65-80 wt%(w/w) based on the total weight of the lubricant composition.

In an embodiment, said mix of additive system consists of:

- sulfurized olefins, di-thiophosphates, mono-thiophosphates, ammonium phosphates and dialkyl phosphates in a concentration range of 4-8 wt% (w/w);
- polyisobutylene based thickener of molecular weight ranging from 400-10500 Da in a concentration range of 10-35 wt% (w/w); and

- polyacrylate based pour point depressant additive of molecular weight range from 400-120000 Da in a concentration range of 0.2-1.5 wt% (w/w).

In yet another embodiment, said composition is capable of reducing NVH in next generation EV propulsion systems of 12000-8000 rpm.

As another aspect, the present invention provides a method of preparing the transmission lubricant oil composition as defined in the present application, wherein said method comprises steps of:

- adding 20-90%(w/w) of primary base oil and 10-80%(w/w) of secondary base oils in a blending container;
- heating the container with agitation and circulation for removal of moisture;
- after removing moisture, normalizing the temperature of the blend to 60-70°C; and
- adding additive components selected from sulfurized olefins, di-thiophosphates, mono-thiophosphates, ammonium phosphates, dialkyl phosphates, polyisobutylene based thickener and polyacrylate based pour point depressant additive in the above blend at a temperature in the range of 60-70 °C with thorough agitation /stirring.

In yet another embodiment of the present invention, concentration of primary base oil is in the range of 40 to 80% (w/w) and concentration of secondary base oil is in the range of 20 to 60% (w/w).

In yet another aspect, the present invention provides a method of reducing noise in e-Axles of electrified platforms, wherein said method comprises the steps of:

- mounting an electrical vehicle on a chassis dynamometer;
- setting up accelerometer and binaural headset/microphone for measurement of high and low speed noise during test cycles;

wherein said test cycles are run on the vehicle for the measurements of noise done as follows:

- 1) High speed noise: Ramping is done till maximum speed, maintaining the speed for few seconds and gradually reducing it to minimum speed.
- 2) Low speed noise: Vehicle is run at 20 kmph in high throttle condition.

The present invention is described in greater detail with reference to the following examples.

Examples:

Example 1: preparation of the candidate oil A

40 to 80%(w/w) of primary base oil and 20 to 60% (w/w) of secondary base oil are added in a blending kettle. The kettle is heated with agitation and circulation for removal of moisture. After removing moisture, normalizing the temperature of the blend to 60-70°C. Thereafter, additive components are added selected from sulfurized olefins, di-thiophosphates, mono-thiophosphates, ammonium phosphates and dialkyl phosphates in a concentration range of 4-8wt% (w/w); polyacrylate based thickener of concentration range of 10-35 wt% (w/w); and polyacrylate based pour point depressant additive concentration range of 0.2-1.5 wt% (w/w) based on the total amount of the composition in the above mixture at a temperature in the range of 60-70 °C with 2 hours thorough agitation /stirring.

Example 2: preparation of the candidate oil B

40 to 80%(w/w) of primary base oil and 20 to 60% (w/w) of secondary base oil are added in a blending kettle. The kettle is heated with agitation and circulation for removal of moisture. After removing moisture, normalizing the temperature of the blend to 60-70°C. Thereafter, additive components are added selected from sulfurized olefins, di-thiophosphates, mono-thiophosphates, ammonium phosphates and dialkyl phosphates in a concentration range of 4-8wt% (w/w); polyisobutylene based thickener of concentration range of 10-35 wt% (w/w); and polyacrylate based pour point depressant additive concentration range of 0.2-1.5 wt% (w/w) based on the total amount of the composition in the above mixture at a temperature in the range of 60-70 °C with 2 hours thorough agitation /stirring.

Example 3: preparation of the candidate oil C

40 to 80%(w/w) of primary base oil and 20 to 60% (w/w) of secondary base oil are added in a blending kettle. The kettle is heated with agitation and circulation for removal of moisture. After removing moisture, normalizing the temperature of the blend to 60-70°C. Thereafter, additive components are added selected from sulfurized olefins, di-thiophosphates, mono-thiophosphates, ammonium phosphates and dialkyl phosphates in a concentration range of 4-8wt% (w/w); polyisobutylene based thickener of concentration range of 10-35 wt% (w/w); and polyacrylate

based pour point depressant additive concentration range of 0.2-1.5 wt% (w/w) and Molybdenum dithio-carbamates of concentration range of 0.1 to 1.5% based on the total amount of the composition in the above mixture at a temperature in the range of 60-70 °C with 2 hours thorough agitation /stirring.

Example 4:

Physicochemical & performance data of candidate oil A, B &C

Table 2

Sr. No.	Properties	Test Method	OIL A	OIL B	OIL C
1	Density at 15°C, gm/cm ³	ASTM D 4052	0.8668	0.8676	0.8679
2	KV at 40°C, cSt	ASTM D 445	93.06	117.1	118.04
3	KV at 100°C, cSt	ASTM D 445	14.74	15.64	15.73
4	Viscosity Index	ASTM D 2270	166	142	141
5	BF at -26°C, cP	ASTM D2983	9318	24695	25156
6	Flash Point, °C	ASTM D 92	214	231	231
7	Pour Point, °C	ASTM D 97	-42	-30	-30
8	Total Acid number, mg KOH/gm	ASTM D 664	1.10	1.32	1.17
9	Aniline Point, °C	ASTM D 611	124	122	122
10	Anti-corrosive Properties on steel at 80°C, 24 hrs, Distilled water	ASTM D 665	Pass	Pass	Pass
11	FZG gear test rig, scuffing load stage	FVA 54/I - IV - HNR.274	14	14	14
12	FZG micro pitting test, failure load stage	FVA 54/, GF-C/8.3/90	10	10	10
13	FAG FE 8 rolling bearing test, wear of rolling element, mg	DIN51819-3- D-7.5 / 80-80	1.8	1.7	1.8
14	FAG FE 8 rolling bearing test, wear cage, mg		116	117.9	118

Example 5:

Performance data on Electric Vehicle Transmission Noise: Table 3 & Graphs 1-6 in Figures 1-6:

Reduction in noise and vibration in mechanical systems can be achieved by several means. One of the approaches is to use lubricants specially designed to reduce generation of acoustical energy in lubricated contacts. Using this approach, efforts were made to screen and develop lubricants that reduce noise in EV transmissions. The approach involved screening oils of various film forming tendencies in laboratory test equipment qualitatively for film formation in terms of film thickness and the traction coefficients. It is reported that with increasing film thickness and traction coefficients, the noise can be attenuated.

Comparisons were made on three candidate oils, OIL A, OIL B & OIL C. Candidate Oil B was found to be most promising based on the above approach and subjected to complete screening.

Methodology followed:

(A) Screening:

(1) Film thickness at 40 and 60 °C -A PCS make EHD (Ultra Thin Film Measurement System) was used to measure the lubricant film thickness properties in the contact formed between a $\frac{3}{4}$ inch (19.05mm) diameter steel ball and a rotating glass disc by optical interferometry. The lubricant film thickness in nanometers at any point in the image can be accurately calculated by measuring the wavelength of light at that point. The results of candidates are summarized in Table 3.

(2) Traction coefficients at 40, 60, 80 and 100 °C - A PCS make MTM (Mini Traction Machine) was used to measure the traction coefficient in the concentrated contacts (Steel ball on steel disc). The simulation of gear contacts can be done using this equipment to simulate the contact pressures, sliding to rolling ratios, temperatures etc. Studies were done at four different temperatures of 40, 60, 80 and 90 °C to assess how the film forming changes with temperatures. It shows higher traction coefficient at all four temperatures for the candidates w.r.t. the reference oil, which indicates better noise attenuation potential. The results of candidates are summarized in Table 3.

(B) NVH Testing

Electric sedan car mounted on a dynamometer and measurements of sounds were done. Various cycles were run on the vehicle and measurements of noise (Whine noise, backlash and tip out noise & Rattle noise) done. Binaural headset/microphone was set on driver and passenger (front seat) position. Sound quality analysis was done through software using FFT (Fast Fourier Transform) analysis.

Table: 3

Oil Name	KV at 40 °C in cSt	Film thickness in nano metres at 30N, 4 m/sec		Traction coefficient MTM at 30N, 600 C		NVH sound level at 1 KHz frequency in automobile transmission	
		At 40°C	At 60°C	At 10% SRR	At 50% SRR	At 20 km per hour in decibels (Gear rattle)	At 80 km per hour in decibels (Gear whine)
OIL A	93.06	623	399	0.025	0.038	25	26
OIL B	117.1	785	487	0.031	0.045	15	18
OIL C	118.04	753	490	0.034	0.048	18	19

Example 6:

Accelerated performance tests on Oil B for durability performance – ISOT Table 4.

Indiana Stirring Oxidation test (ISOT) (JIS 2514): ISOT is used for the evaluation of the oxidation stability of lubricants such as gear oils, ATFs, Diesel engine oils and PCMO oils. Combination of Steel (0.5 mm thickness, 25 mm in width and 135mm in length) and Copper (0.5mm in thickness, 25mm width and 76 mm length) as catalyst and varnish rods are used to assess the severity of the oxidation. Catalyst dipped in 300 ml test sample in a glass vessel along with varnish sticks in a covered beaker at 165.5°C and 1300 rpm for specified duration of time. Kinematic Viscosity ratio and Total acid number change with reference to fresh sample give the indication of the oxidation performance. Oil B was tested w.r.t industry reference.

Table 4

Test condition: Temp-165.5°C, 1300 rpm, Copper – Steel catalyst, Test sample analysis duration: 24, 48, 72 & 96 hrs

Test duration (hrs)	Reference Oil					OIL B				
	0	24	48	72	96	0	24	48	72	96
Properties	Fresh	Used	Used	Used	Used	Fresh	Used	Used	Used	Used
KV at 100°C, cSt	14.5	15.98	16.64	18.936	21.497	15.63	16.65	18.07	19.04	20.23
KV at 40°C, cSt	149.3	172.9	182.4	212.53	243.74	116.6	126.2	140	150.5	161.1
VI	94.6	95	96	100	105	142	143	144	144	146
a) Viscosity ratio at 40 °C	NA	1.15	1.22	1.42	1.63	NA	1.08	1.20	1.29	1.38
b) Change in TAN, mg of KOH/gm	NA	0.41	0.54	3.12	17.22	NA	2.19	2.96	3.06	3.33
c) Lacquering										
Color No	NA	9	9	9	9	NA	1	1	1	7
Symbol	NA	BL	BL	BL	BL	NA	VLAL & RL	VLAL & RL	VLAL & RL	VLAL & RL
Color Coefficient	NA	0.1	0.1	0.1	0.1	NA	0.01	0.01	0.01	0.025

Example 7:

Accelerated performance tests on Oil B for durability performance –Forschungsstelle fur Zahnrad und Getriebebau (FZG)Table 4.Inadequate film thickness is the main cause of high wear at low circumferential speeds under 0.2 m/s. FZG, a back-to-back rig test is widely used to evaluate the anti-scuffing properties of oils for reduction gears, hypoid gears, automatic transmission gears, etc. A specially developed FZG micro pitting test method was used to specify the oil performance in terms of durability.

Test condition: Load Stage: 6th stage Torque, Test temperature: 120°C on A type Gear set.
Test duration: 96hrs (Sample analysis interval: 24, 48, 72 & 96 hrs).

Table 5

Test duration (Hrs)	Unit	ASTM Method	Reference Oil				OIL B			
			24	48	72	96	24	48	72	96
Viscosity at 100°C	cst	D-445	13.67	14.36	14.24	14.54	15.00	14.345	15.026	14.78
Viscosity at 40°C	cst	D-445	141.46	146.78	148.21	149.68	115.91	103.99	112.58	110.39
VI		D-2270	91	95	92.9	95	134	141	139	138
TAN	mg KOH/gm	D-664	2.99	3.23	3.59	3.91	1.08	1.08	1.18	1.25
FTIR Data		E-2412								
Oxidation	A/cm		5.00	3.14	3.62	4.34	0.69	1.12	1.47	1.96
Wear Elements		D-6595								
Iron	ppm		13	21	22	24	3	3	4	4
Chromium	ppm		0	0	0	0	0	0	0	0
Copper	ppm		6	6	5	6	9	11	9	8
Nickel	ppm		0	0	0	0	0	1	0	0
Aluminium	ppm		0	1	1	0	0	0	0	0
Lead	ppm		0	1	0	0	1	1	0	2
Tin	ppm		2	4	5	1	0	0	0	0
Contaminants		D-6595								
Silicon	ppm		0	0	0	0	0	0	0	0
Vanadium	ppm		0	0	1	0	1	0	1	0

Technical advantages of the invention:

The present invention has the following advantage over the prior arts:

1. Lubricant Composition is suitable for use in e-Axle application where a single or double speed gear box is used and motor, electronics and differential units are integrated in a full battery electric vehicle (BEV).
2. Lubricant Composition has potential of providing oil drain interval of 50000-60000 km more preferably 30000 - 40000 km in Battery operated electric passenger cars(Full BEV) with e-Axle as main drive train device.
3. Lubricant composition has potential to reduce noise in e-Axles (Gears, electronics and e-motor) of electrified platforms to deliver challenging NVH reduction in

next generation EV propulsion systems of 20,000rpm more preferably of 12000-8000 rpm.

4. Lubricant composition for Single or double speed reduction gear box with electric motor of 20,000rpm more preferably of 12000-8000 rpm or more preferable 3000-4000 rpm.
5. Lubricant composition which has balanced load carrying and copper corrosion protection required for e-Axle applications.
6. Lubricant composition for e-axle applications having FZG scuffing load capacity of 14 load stage more preferably 12 -10 load stage.
7. Lubricant composition which has lower operating temperature suitability up to -27°C and upper temperature operating suitability of 150°C.
8. Lubricant composition has superior oxidation performance.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained, and since certain changes may be made in the constructions set forth without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense. The invention has been described with reference to preferred and alternate embodiments. Modifications and alterations will become apparent to those skilled in the art upon reading and understanding the detailed discussion of the invention provided herein. This invention is intended to include all such modifications and alterations insofar as they come within the scope of the present invention. These and other modifications of the preferred embodiments as well as other embodiments of the invention will be obvious from the disclosure herein, whereby the foregoing descriptive matter is to be interpreted merely as illustrative of the invention and not as a limitation.

Finally, to the extent necessary to understand or complete the disclosure of the present invention, all publications, patents, and patent applications mentioned herein are expressly incorporated by reference therein to the same extent as though each were individually so incorporated.

Claims:

1. A transmission lubricant composition to reduce noise in e-Axles of electrified platforms, wherein said composition comprising:
 - a) a base oil required for necessary film-thickness under high shear conditions, wherein said base oil consists of a primary base oil and a secondary base oil; wherein said primary base oil has viscosity ranging from 3-11 cSt at 100°C and viscosity index value in the range of 100-130;
wherein said secondary base oil has viscosity ranging from 20-40 cSt at 100°C and viscosity index value in the range of 80-95 and;
 - b) a mix of additive system;
wherein the said mix of additive system consists of:
 - sulfurized olefins, di-thiophosphates, mono-thiophosphates, ammonium phosphates and dialkyl phosphates in a concentration range of 4-8 wt%(w/w) based on the total weight of the lubricant composition;
 - polyisobutylene based thickener of molecular weight ranging from 400-10500 Da in a concentration range of 10-35 wt%(w/w) based on the total weight of the lubricant composition; and
 - polyacrylate based pour point depressant additive of molecular weight range from 400-120000 Da in a concentration range of 0.2-1.5 wt% (w/w) based on the total weight of the lubricant composition,wherein the total base oil concentration is ranged from 65-80 wt% (w/w) based on the total weight of the lubricant composition,

said composition is capable of reducing noise, vibration and harshness (NVH) in next generation Electric Vehicle (EV) propulsion systems of 20,000 rpm.
2. The transmission lubricant composition as claimed in claim 1, wherein said e-Axles are gears, electronics and e-motor.
3. The transmission lubricant composition as claimed in claim 1, wherein said base oil is selected from Group (GP) I, GP II, GP III, GP IV and mixture thereof; wherein said base

oil has viscosity range of 3 - 40 cSt at 100°C, sulphur content of 10-20,000 ppm, hydrocarbon range of 0-10 % (Ca), 60-85 % (Cp), 15-25 % (Cn) and pour point between 0 to -36°C.

4. The transmission lubricant composition as claimed in claim 1, wherein said composition is capable of reducing NVH in next generation EV propulsion systems of 12000-8000 rpm.
5. A method of preparing the transmission lubricant oil composition as claimed in claim 1, wherein said method comprises steps of:
 - adding 20-90%(w/w) of primary base oil and 10-80%(w/w) of secondary base oils in a blending container to prepare a base oil; wherein said primary base oil has viscosity ranging from 3-11 cSt at 100°C and viscosity index value in the range of 100-130; wherein said secondary base oil has viscosity ranging from 20-40 cSt at 100°C and viscosity index value in the range of 80-95;
 - heating the container with agitation and circulation for removal of moisture;
 - after removing moisture, normalizing the temperature of the blend of the base oil to 60-70°C; and
 - adding additive components selected from sulfurized olefins, di-thiophosphates, mono-thiophosphates, ammonium phosphates, dialkyl phosphates, in a concentration range of 4-8 wt%(w/w) based on the total weight of the lubricant composition; polyisobutylene based thickener of molecular weight ranging from 400-10500 Da in a concentration range of 10-35 wt%(w/w) based on the total weight of the lubricant composition; and polyacrylate based pour point depressant additive of molecular weight range from 400-120000 Da in a concentration range of 0.2-1.5 wt% (w/w) based on the total weight of the lubricant composition; in the above blend of the base oil at a temperature in the range of 60-70 °C with thorough agitation /stirring, wherein the total base oil concentration is ranged from 65-80 wt% (w/w) based on the total weight of the lubricant.

6. The method as claimed in claim 5, wherein concentration of primary base oil is in the range of 40 to 80% (w/w) and concentration of secondary base oil is in the range of 20 to 60% (w/w), wherein the primary base oil and secondary base oil concentration is based on the total weight of the base oil.