DESIGN AND DEVELOPMENT OF TWO SPEED GEAR BOX FOR AGRO MACHINERY

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Abstract: Conventional gearboxes are capable of varying a given input speed. It is achieved by meshing of gears in various gear ratios. The torque values are different during different gear ratios. Hybrid gearboxes are capable of transmitting various torque levels at the same gear ratio. They have a high torque producing capacity compared to a conventional gearbox. These gearboxes have provisions for several inputs and several outputs, unlike one input and one output of a conventional gearbox. It allows the choice of varied speeds to the inputs. These gearboxes can be used in a lot of practical applications. As they have very high loading capacities, they can be used in off-road, commercial vehicles, military vehicles and other specialty vehicles. They can also be used in cranes, pumps, tractors, lawn mowers etc. Its most important application is that it can be used in a hybrid car.

I. INTRODUCTION

GEARBOX:

A transmission is a machine in a power transmission system, which provides controlled application of the power. Often the term transmission refers simply to the gearbox that uses gears and gear trains to provide speed and torque conversions from a rotating power source to another device. The most common use is in motor vehicles, where the transmission adapts the output of the internal combustion engine to the drive wheels. Such engines need to operate at a relatively high rotational speed, which is inappropriate for starting, stopping, and slower travel. The transmission reduces the higher engine speed to the slower wheel speed, increasingtorque in the process. Transmissions are also used on pedal bicycles, fixed machines, and where different rotational speeds and torques are adapted. In motor vehicles, the transmission generally is connected to the engine crankshaft via a flywheel or clutch or fluid coupling, partly because internal combustion engines cannot run below a particular speed. The output of the transmission is transmitted via the driveshaft to one or more differentials, which drives the wheels. While a differential may also provide gear reduction, its primary purpose is to permit the wheels at either end of an axle to rotate at different speeds as it changes the direction of rotation.

Most modern gearboxes are used to increase torque while reducing the speed of a prime mover output shaft (e.g. a motor crankshaft). This means that the output shaft of a gearbox rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque. A gearbox can be set up to do the opposite and provide an increase in shaft speed with a reduction of torque. Someof the simplest gearboxes merely change the physical rotational direction of power transmission.

TYPES OF GEARBOX:

1. Manual Transmission Gearbox
2. Automatic Transmission Gear box

1.Manual Transmission Gearbox:
In this type of transmission different speed ratio or gear ratio isselected by the driver manually. Some special skill of driving is required to operate this type of gear box. According to their design, this is subdivided intothree types.

2.Automatic Transmission Gear box:
When we talk about transmission, the automatic transmission is unforgettable. A transmission in which various speeds

are obtained automatically is known as automatic transmission. In this type of gear box driver merely selects the general car condition such as forward or reverse.The selection, timing and engagement of gear for the required gear speed are accomplished automatically when the accelerator is pressed or depressed. Automatic transmission needs no gear change lever and clutch pedal since clutch and transmission is a combined unit and works automatically.

II. LITERATURE SURVEY

MarutiPatil, P Ramkumar, K Shankar (30/01/2019) [1] Multi objective minimization of power loss and volume of a two-stage helical gearbox with additional novel tribological constraints was carried out. The results were compared with a single objective optimization with and without tribological constraints. The single objective problems minimize the volume only following the traditional approach in gear optimization literature. The simulation was done for a variety of oils (ISD VG 68,150,360 and 580) and at 1000 and 1500 rpm with three different gear profiles.

F Elbarghathi, T Wang, D Zhen, F Gu and A Ball (**2012**) [3] CWT (Continuous Wavelet Transformation) has been shown to be an effective tool for rotating machinery fault detection and diagnosis. In this study, the fault diagnosis of a two-stage helical gearbox is carried out based on the CWT analysis and TSA techniques. TSA allows the noisy components to be removed significantly and hence highlights the fault related impulse components which paves the basis for accurate feature extraction. Moreover, three types of wavelets: db1, sym2 and coif3 were explored to find the optimalwavelet for separating the small fault. The results have shown that wavelet db1 produces the best fault separation whereas the coif3 wavelet fails to do the separation. It means that different wavelets produce different separation results

Yanxue Wang, Zhengjia He et al. (**2011**) [4] Based on the ITFS constructed by LMD, a fault detection technique is developed for the industrialgearbox applications. ITFS can early and reliably detect the local gear tooth damage using practical vibration signals. A new gear diagnosis parameter EDR is also presented and investigated in the paper. It is demonstrated that the proposed new parameter EDR has better consistence over time than the traditional kurtosis, rms and peak-to-peak values as well as energy-based features NP4 and Mx derived from ITFS. Surveillance, diagnostics and severity assessment of the industrial gearbox are all investigated in this work. Remaining life prognosis using the new parameter EDR may be conducted in the future research.

Dusan J. Hvolka (**2009**) [5] the two-speed gearbox connects to an axle operatively driven by a torque source associated with its Sun gear of a centralplanetary gearing system via coupling means. Means for shifting from the firstmode low gear ratio mode to a second-high gear ratio mode are included via selective application of the low and high-speed clutches to secure either the Sun gear and/or the ring gear of the central planetary gearing system to provide a plurality of geared outputs relative to the torque inputs. Where additional torque ratios are required, an auxiliary gearbox may be included to provide the required input into the two-speed gearbox from multiple drive sources.

J. Rafiee, F. Arvani (**2006**) [6] An ANN-based procedure was presentedfor fault detection and identification of gearboxes using a new feature vector extracted from standard deviation of wavelet packet coefficients of vibration signals of various fault's and for conditions of the Over and above the structure of ANN, an appropriate feature vector plays a vital role in training high performance ANN PCHI was used to synchronise the vibration signals station of a time-frequency-based approach specifically WT which often reveals the faults the best is mandatory. Ultimately an MLP network with a 16:20:5 structure has been used that not only is small in size but also with a 100% perfect accuracy and performance to identify gear failures and detect bearing defects.

TaharFakhfakh, Mohamed Haddar(**2005**) [8] In this paper, the two- stage gear system was modelled by a 12 degrees of freedom system with a time varying stiffness matrix. In the first time. A step-by-step time integration method (Newmark algorithm) was used to obtain this dynamic behaviour. Thefrequency dynamic response shows the domination of the peaks corresponding to the mesh frequencies. The dynamic response fluctuations are minimum for the third wheel's location (β2 =90◦) that permits to reduce the gearbox size.

III. METHODOLOGY

Construction:
1.   Sliding mesh gear box made up of helical gear it consist of two shaft.
2.   One shaft is input shaft which is connected to the engine output shaft bycoupling which has internal splines.
3.   Input shaft has contains two helical gear which connect by using splines.
4.   Two gear having one is LH and other is RH gear.

5.   Another is output shaft in which one end of shaft connected to fan whichspray fluid
6.   To output shaft rigidly connect a gear that output gear LH and RH
7.   This whole assembly covered by casing in which two shaft fitted withbearing
8.   Top of casing contains cover with fork mechanism
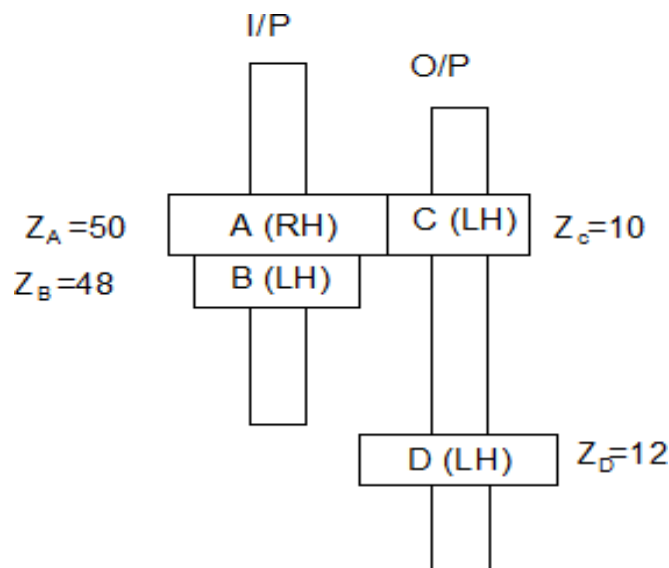9.   To avoid leakage, oil seal housing are used which fitted in casing

Working:

Two input gear are in middle condition, so it is not mesh to the outputgear has zero rotation.
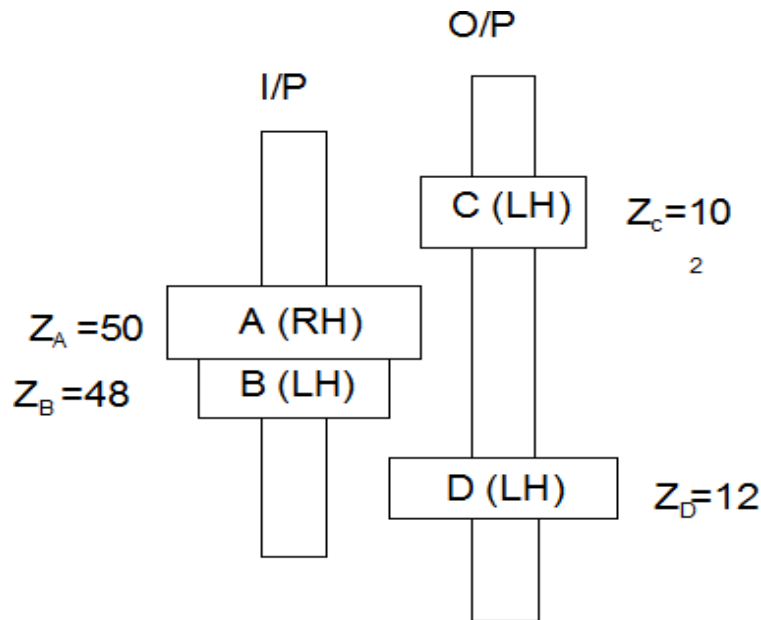
Fig. Gear middle condiation

1st gear - (ratio 1:5):

To achieve this ratio, sliding unit (A & B) on splines of I/P shaft and input gear 'A' mesh with output gear 'C'

Fig. Gear First position

2st gear - (ratio 1:4)

To archive this ratio, sliding input gear (A & B) on splines of I/P shaft such that input gear B mesh with output gear 'D'
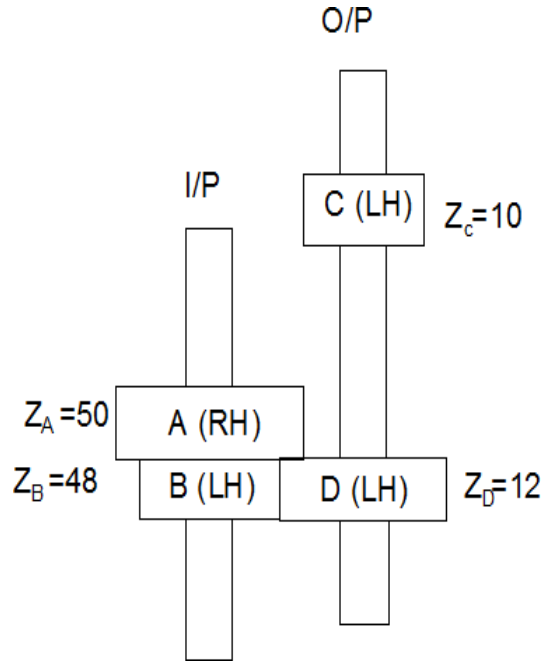
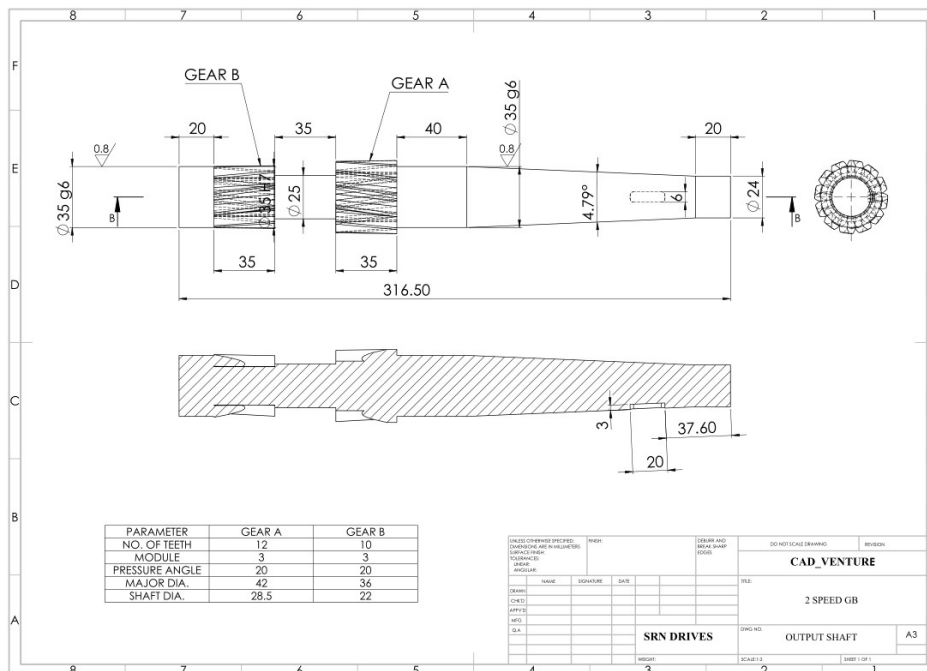**Fig. Gear second position**

IV. DRAWING

Fig. Output shaft drawing

Fig. Plate drawing

Fig. Casing drawing

V. RESULTS

SR NO	INPUT POWER(HP)	INPUTRPM	RATIO	OUTPUTRPM	OBSERVATION
1	25	1000	1:04	4000	SMOTH WORKING
2			1:05	5000	NOISE
3	22	850	1:04	3400	SMOTH WORKING
4			1:05	4250	NOISE
5	20	800	1:04	3200	SMOTH WORKING
6			1:05	4000	SMOTH WORKING
7	18	750	1:04	3000	SMOTH WORKING
8			1:05	3750	SMOTH WORKING

VI. CONCLUSION

Today's Gearboxes in All Terrain Vehicles occupy more space, heavy and have limited life based on the operation. Operating these Gearboxes for continuously will produce heat that may affect the structural integrity. The high speed gear box designed to be coupled with engine PTO that can vary the transmission ratios. Increase RPM from Engine PTO to Fan Out-put. Based on the analytical calculations and Finite Element Analysis we can conclude that all the components are not bound to failure within the given working parameters. The Gearbox is lightweight, compact and has increased life over the conventional Manual Gearboxes.

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