

## Modeling and Simulation of Multi-Drive Clutch

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**Abstract**— The transmission of power from driving shaft to driven shaft is generally carried out by clutch. Hence the mechanism used in the clutch assembly plays an important role in the power transmission. One of the vital system of the automobile is clutch system. The occurrence of slippage between the friction plate and flywheel generates excessive amount of heat energy which leads to the rise in the temperature at their operating surface. Due to this continuous action clutch system undergoes surface thermo-mechanical deformation and also there are burnout and wear-out chances. In this paper the clutch is designed by combining centrifugal action in single plate clutch transmission mechanism, to overcome above drawbacks. Various transmission model of clutch is prepared by using modelling software NX-CAD unigraphics.

**Keywords**— Assembly, NX-CAD, Slippage, Thermo-mechanical deformation, Transmission.

### I. INTRODUCTION

The transmission of power with maximum torque is the main intention of the clutch system. Positive and friction clutches are the two type of clutches. Which are classified as plate, cone, centrifugal clutch.

Single plate clutch are common clutch used for providing quick disengagement. Cover and flywheel are the driving members in which pressure plate is carried by cover, whereas entire assembly of clutch is bolted to the flywheel. The pressure plate and flywheel are gripped by the driven member. This plate is free to move on the shaft spline. The clutch disc is the driven member which is provided with ventilation so that heat energy dissipates during the operation of the clutch. At the time of their working rate of heat generation is high.

In centrifugal clutch the spring are eliminated completely and only centrifugal force is used to apply the required pressure for keeping the clutch in engage position.

No separate clutch pedal is required this is the main benefit of the centrifugal clutch. And also clutch is operated automatically depending upon the engine speed.

### II. OBJECTIVE

We observed that, the main objective of this concept is to overcome the consequence or the drawbacks associate with the Centrifugal clutch and Single Plate clutch. The objectives are as follows:

1. Improvement in torque transmissibility.
2. To reduce slip factor.
3. To reduce heat generation.
4. To reduce burnout chances of friction plate.
5. Decrease in wear out rate.
6. Increase durability of clutch plate.

### III. CONCEPT OF MDC

MDC is called as multi-drive clutch . MDC is the combination of three clutches that are positive jaw clutch single plate clutch and centrifugal clutch. Jaw clutch has maximum heat generation capacity while single plate clutch has drawbacks such as slip, torque transmitting capacity is less and Centrifugal clutch has less starting torque. These are the vital drawback in above clutches which are overcome in multi drive clutch.

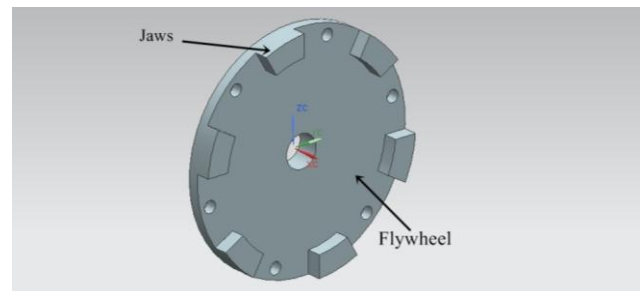
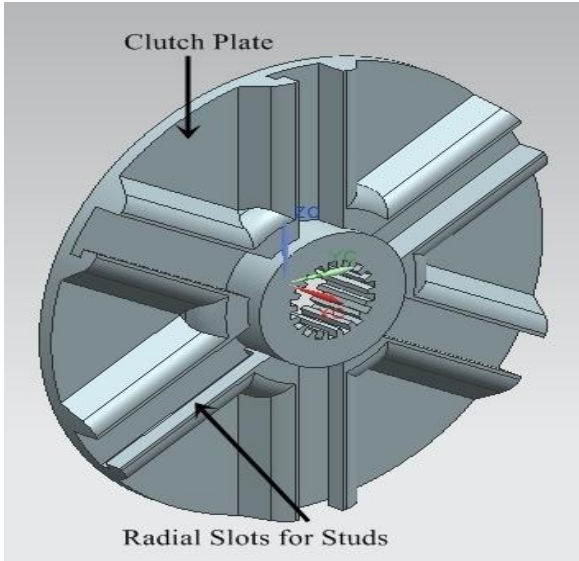
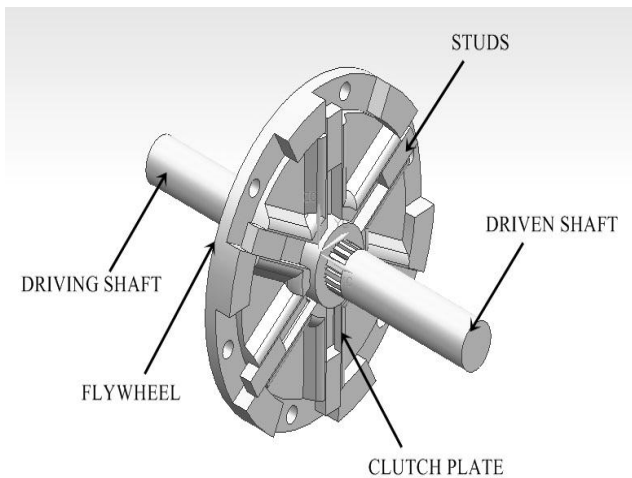


Fig. Flywheel.



**Fig. Clutch Plate.**

#### IV. WORKING PRINCIPLE OF MDC



**Fig. Assembly of MDC**

As shown in above fig, driving shaft is connected to engine. Initially the clutch is in disengaged position. Driving shaft is rotating with certain rpm. This motion is transmitted to flywheel as it is fixed on driving shaft. To transmit this motion to driven shaft the clutch plate is to be engaged to flywheel. The friction lining present on clutch plate transmits power from flywheel to clutch plate by virtue of its friction.

As speed of flywheel increases this power is transmitted to clutch plate and thus to the driven shaft. This concept is similar to single plate clutch. But there is occurrence of slip between clutch plate and flywheel due to lack of friction between facing of flywheel and clutch plate. Hence to overcome this, after attaining certain speed studs located in clutch plate engages to jaws of flywheel. This is done by action of centrifugal force on the studs. Due to engagement of studs to jaws of flywheel turns the friction clutch into positive drive clutch.

Disengagement of clutch is same as single plate clutch. After disengagement of clutch the speed of driven shaft decreases, hence there is decrease in centrifugal force acting on studs also decreases. This retains studs inside slots in clutch plate.

Thus this clutch acts as both frictional drive and positive drive.

#### V. CONCLUSION

From this comparison we can conclude that above mention objectives can be overcome by using this type of assembly for the clutch. As per proposed design the friction drive clutch can be converted into positive drive clutch during working.

Due to this arrangement in clutch system there is improvement in transmissibility of torque and also there is reduction in slip factor. There is less heat generation due to frequent smooth engagement of the clutch plate. The problem of burnout and wear out can be eliminated by using this type of clutch, henceforth we can say that there is increase in durability of clutch system than any other type of conventional clutch system.

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