Design & Analysis of Self Align Clutch: A Review
Raxit Umretiya 1 Mohit Lakhwani 2
1Gujarat Technological University, India 2Atmiya Institute of Technology and Science, India.

Abstract—Self align clutch system comprise of flywheel, clutch disc plate, clutch cover, diaphragm spring, ball and the linkage necessary to operate the clutch. Ball bearings included to support radial load and concentricity between races. This type of clutch is most widely used in vial conveyor turntable to disengage motor from reducer without stopping the motor or cutting the power. This paper describes detailed study of self align clutch used in various industrial machines for transmitting power to driven pulley by drive pulley where is requirement of accuracy and precise engagement. This research includes exploded view of modeling of self align clutch using Creo in additional to detail and assembly drawing. Analytical design and computerized design done thorough ANSYS are compared during research.

Key words: Creo, ANSYS, Self align clutch, Turntable, Ball bearing, Vial conveyor, etc

I. INTRODUCTION
Self align clutch system comprise of flywheel, clutch disc plate, clutch cover, diaphragm spring, ball and the linkage necessary to operate the clutch. Ball bearings included to support radial load and concentricity between races. This type of clutch is most widely used in vial conveyor turntable to disengage motor from reducer without stopping the motor or cutting the power.

A clutch is a mechanical device for quickly and easily connecting or disconnecting a pair of rotating coaxial shafts. It is usually placed between the driving motor and the input shaft to a machine, permitting the engine to be started in an unloaded state. Single plate, dry clutch is among the popular type of clutches in use. A clutch is a mechanism designed to disconnect and reconnect driving and driven members. It is a device, which enables one rotary drive shaft to be coupled to another shaft, either when both the shafts are stationary or when there is relative motion between them. The need for the clutch seems mainly from the characteristics of the turning-effort developed by the engine over its lower speed range. When idling, the engine develops insufficient torque for the transmission to be positively engaged. To obtain a smooth engagement, the clutch has to be progressively engaged to take up the drive until the torque transmitted from the engine equals that required to propel the vehicle. Also the clutch disconnects the engine from the transmission to change the gear. The clutch, thus, takes up the drive smoothly and also disengages the drive whenever necessary.

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When the clutch pedal is depressed, the flywheel, clutch disc, and pressure plate are disengaged, thus power flow is interrupted. As the clutch pedal is released, the pressure plate moves closer to the driven plate and the flywheel; clamping the plate between the pressure plate and the flywheel. If the transmission is in gear, power is transferred from the input to the output.

After the break down or stoppage of the machine the clutch takes more time to align the rotating shaft. With the help of this SELFT – ALIGNING CLUTCH it can solve.

II. TYPES OF CLUTCH
A. Friction Clutches:
- Multiple plate clutch
- Wet & dry
- Centrifugal
- Cone clutch
- Torque limiter
- Non-slip clutches

B. Other Clutches on The Base Of Applications:
- Self align clutch
- Single-revolution clutch
- Cascaded-pawl single-revolution clutches
- Kickback clutch-brakes
- Lock-up clutch

III. PURPOSE AND COMPONENTS OF THE SELF ALIGN CLUTCH (BALL CATCHER CLUTCH) AND COMPONENTS
The main purpose of this clutch is to provide smooth operation during engagement of pulley after breakdown or stoppage of machine. This clutching mechanism can be set very accurately to control torque.

A self align clutch should possess the following components or elements:
- Hub
- Clutch housing
- Bearing
- Spring
- Ball
- Clutch plate
- Key
- Bearing support

IV. MODELING
Modeling of existing self align clutch is modeled in Creo. Different views of self align clutch is as below.

Fig. 1: Default view of self align clutch
carried out by a machine that packages liquid products such as cold drinks or water. Traditional methods of bottle filling involved placing bottles onto a conveyor and filling only one bottle at a time. A conveyor uses ball catcher clutch/self align clutch for smooth operation [5].

The parts of a single plate clutch can be seen below. It has only one clutch plate, mounted on the splines of the clutch shaft. This is the most commonly used type. The flywheel is mounted on the crankshaft, and rotates with it. The pressure plate is fixed on the flywheel through the pressure plate is fixed on the flywheel through the clutch springs. The plate rotates freely on the clutch shaft. It can also be moved axially along the clutch shaft. The axial movement of the pressure plate is effected by pressing the clutch pedal. The end of the clutch shaft rests and rotates freely in the pilot bearing housed at the centre of the flywheel. The splined portion of the clutch shaft carries the clutch plate whose details are shown in the figure [6].

V. LITERATURE REVIEW

I have studied about a clutch release bearing assembly with an internal bearing assembly. The internal bearing assembly is a tubular sleeve and has perforations in it for holding ball bearings. A tubular collar rides over the internal bearing assembly. A conventional clutch release bearing assembly rides over the inner collar. The internal bearing keeps the conventional bearing assembly centre on the transmission shaft and provides free movement with only minimal clearance there between [1].

Engineering fundamentals of clutches and plates have been studied. Why we are using the clutch for automobile and mechanical industry is described in this literature. The clutch has many technical developments from throughout the history of automobile. Electric and steam power systems did not need a clutch due to their practically ideal for couple transmission. With the invention of the internal combustion engine it has changed output power while the engine turning was consequently necessary means disconnecting the engine and transmission [2]. Uses of clutch and various types of clutches are explained in this literature. So we can differentiate various types of clutches and compare with each other [4].

During reassembly, alternating inner and outer clutch discs were combined to form a multi disc assembly. The outcome was that form a drive disc always followed by a driven pulley and vice versa. These balls were compressed by confidence bands for each clutch spring. All clutch plate assemblies therefore engaged one after another. This gradual increase in friction meant that multiple disc clutches engaged very gently. As resilience was released from the disc once more disengaged [3]. Liquid filling is a task

VI. AIM AND SCOPE OF THE WORK

This work deals with the analysis and design of self align ball-catcher clutch which is used for smooth working, precise engagement of machine. After researching and studying on this clutch, it was found that during its operating condition, it takes some time for alignment and wear occurs during alignment of balls. Main purpose of using this clutch in pharmaceutical machine is to eliminate friction, smooth engagement. And problems occurring in application of clutch will be eliminated by modifying design of clutch and can be fulfill main purpose of clutch used in machine.

VII. CONCLUSION

For accurate and precise engagement in mostly pharmaceutical machinery, self align clutches are used. It provides rotation very smooth and having very less friction in clutch engagement. For less friction during engagement, ball bearing type mechanism is provided. Self align clutch uses plates, diaphragm spring, ball, hub, bearing for assembly. Clutch was modeled in Creo and analyzed data in ANSYS. It is found that during its operating condition, it takes some time for alignment and wear occurs during alignment of balls. In future, it can be eliminated by modifying existing design and analyzing it using ANSYS, it can be implemented on practical operation. In my PG dissertation, this research will help me for future
modification of clutch for eliminating problem caused during alignment.

REFERENCES