The cycloidal reducer has already been used widely in many equipment due to its capability of significant speed and torque conversion. Because of the advantage of cycloidal reducer about long service life, compact structure and great load capacity, it is a commonly used solution for limited space applications today.

Botsiber and Kingston [1] proposed the application of the cycloidal reducer. It basically consists of four components: a high-speed input shaft composed of an eccentric cam, a cycloidal gear, a ring gear made up of several rollers on the circular pitch line, and a low-speed output shaft. Generally, there are four types of cycloidal reducer on the basis of whether epicycloid or hypocycloid type and which is the fixed link among the cycloidal gear and the ring gear. They are stationary ring gear type epicycloid reducer, rotating ring gear type epicycloid reducer, stationary ring gear type hypocycloid reducer, and rotating ring gear type hypocycloid reducer.

Taking the fixed ring gear type as an example, as the input shaft rotates, it makes the cycloidal gear to roll along the inner edge of the ring gear, exhibiting a motion pattern akin to planetary gears. As the cycloidal gear revolves around the center of the ring gear, it slowly rotates in the opposite direction about the input shaft at the same time.

In some case, the cycloidal reducer will be used on precision machine like robot or machine tool. In this instance, the requirement of the motion error becomes extremely important. And the profile of cycloidal gear is much more difficult than others shape, it makes the processing method not as easy as usual. Some scholars have conducted relevant work on the mechanical error analysis of cycloidal gear to date. Malhotra and Parameswaran studied the effects of design parameters on the forces of various components of the cycloidal gear reducer, as well as its theoretical efficiency. Blanche and Yang developed an analysis model for cycloidal gear based on machining tolerances and proposed a computer-aided analysis program to verify the performance of cycloidal gear.

Most of method of an analysis Rely on computer simulation calculations, they take time and need