ISSN XXXX XXXX © 2018 IJESC

Research Article Volume 8 Issue No.3

# Portable Arrangement for Plastic Extruder

Dr.Govindaraju Kannan.G[1], Kannan Guruprasad[2], Selvaraj Chandramohan[3]
Professor[1], UG Student[2, 3]
Department of Mechanical Engineering,
IFET College of Engineering, Villupuram, India

**Abstract:**
The project is about making the plastic extruder portable by setting up a spur gear arrangement on the front side to carry the maximum loads. Other four sides are supported by means of rollers which are fixed trisectionaly to carry the remaining load. The system is modify the system to work automatically with the help of the gear arrangement attached to shaft. This transmits the movement when the shaft is rotated. The shaft is rotated by means of the lever which is connected to the shaft and other end is connected to the gear which gets rotation.

**Keywords:** Plastic extruder, gear arrangement, lever operated, shaft, rollers.

## I. INTRODUCTION

In the extrusion of plastics, the raw compound material is commonly in the form of hurdles that are gravity fed from a top mounted hopper into the barrel of the extruder. Additives such as colorants and UV inhibitors are often used and can be mixed into the resin prior to arriving at the hopper. The process has much in common with plastic injection molding from the point of the extruder technology though it differs in that it is usually a continuous process. While pultrusion can offer many similar profiles in continuous lengths, usually with added reinforcing, this is achieved by pulling the finished product out of a die instead of extruding the polymer melt through a die. The material enters through the feed throat and comes into contact with the screw. The rotating screw forces the plastic beads forward into the heated barrel. The desired extrusion temperature is rarely equal to the set temperature of the barrel due to viscous heating and other effects. In most processes, a heating profile is set for the barrel in which three or more independent PID-controlled heater zones gradually increase the temperature of the barrel from the rear to the front. This allows the plastic beads to melt gradually as they are pushed through the barrel and lowers the risk of overheating which may cause degradation in the polymer.

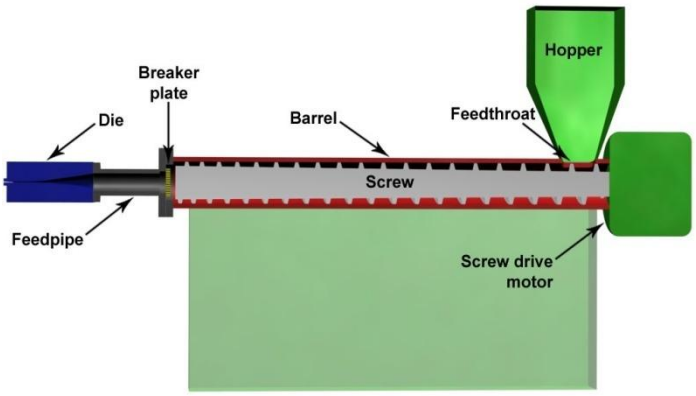


**Figure.1. Screw extrusion process**

## II. EXSTING SYSTEM

The above figure shows the extruder base which is fixed and it is not portable. while doing maintenance it is not easy to move the frame and this process requires crane to lift the heavy die components which is of 250 kg in weight. They generally use the crane to change the die according to their order and to change the length of the sheet also.so they requires a potable base to move the frame along with the die in the easy manner. The die is what gives the final product its profile and must be designed so that the molten plastic evenly flows from a cylindrical profile, to the product's profile shape. Uneven flow at this stage can produce a product with unwanted residual stresses at certain points in the profile which can cause warping upon cooling. A wide variety of shapes can be created, restricted to continuous profiles. This was the main problem in the extruder to change the dies and to change the frame during the repair period. The fig 2.2 shows the existing method which the company is using. To overcome this we have designed the spur gear with the lever arrangement which is connected by means of the shaft.

**Figure.2. Extruder base**

## III. LITERATURE REVIEW

Kang et al (2002) performed the direct and indirect extrusion process on copper-clad Aluminum rod. Extrusion of copper-clad

Aluminum rod was simulated using a commercially available finite element package; DEFORM which can be used to simulate metal forming and heat transfer, welding and machining processes. The simulations were performed for copper-clad Aluminum rod to predict the distributions of temperature, effective stress, effective strain rate and mean stress for various sheet thickness, die exit diameters and die temperatures. From the simulations, it was found that the larger the die outlet diameter, better thickness of the sheath material can be acquired. It was also found that the experimental result with lubricant material such as carbon oil exhibited good agreement of extrusion force with finite element analysis. It was concluded that when die and sleeve temperature is less than that of billet, it was found that the extrusion ability inclad composites has not improved due to difference in flow stress.

## IV. PORTABLE SYSTEM

The existing extruder model is displayed in the below figure in which there is no portable option ,the dies and frames are removed by means of the crane only which is very tedious work during the maintenance period To overcome this problem the spur gear setup is mounted on the front side and it is rotated by means of the lever which is manually operated under the ratio of 2:1.It generally driven by means of the shaft which is connected to the gears. By means of this when the lever gets rotated the shaft transmits the power to the gears which in turns move the frame in the forward position.

## V. COMPONENTS USED

**A-**Spur gear.
**B**-Shaft.
**C-**Bearings.
**D**- Sprockets.
**E**-Roller.

### A. SPUR GEAR

The gear used here was spur and which contains 30 teeth to transmit the load about 650 kilograms. The material in which the gear is made was the mild steel. Spur gear or cogwheel is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part to transmit torque. Geared devices can change the speed, torque, and direction of a power source. Gears almost always produce a change in torque, creating a mechanical advantage, through their gear ratio, and thus may be considered a simple machine. The teeth on the two meshing gears all have the same shape. Two or more meshing gears, working in a sequence, are called a gear train or a transmission. A gear can mesh with a linear toothed part, called a rack, thereby producing translation instead of rotation. The gears in a transmission are analogous to the wheels in a crossed, belt pulley system. An advantage of gears is that the teeth of a gear prevent slippage.

**Figure.3. Spur gear**

### B-SHAFT

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power the various members such as pulleys and gears are mounted on it. Shaft must be strong to resist the twisting action of the driving torque and it should be resilient to absorb the torsional shocks. It must resist the natural tendency to sag under its own weight because vibration occurs. A tubular-section propeller shaft is normally used because it has

(i) low weight,
(ii) provides large resistance to misalignment, especially sag, has good torsional strength, and
(iii) Provides low resistance to changes in angular speed, which arise when a hooks type coupling is used to drive the shaft.

**Figure.4. Shaft**

### C-BEARINGS

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

### D-SPROCKETS

A sprocket is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth. Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc.

### E-ROLLER

A more recent exception to this is the Torsion differential, which uses worms and planetary worm gears in place of the bevel gearing of conventional open differentials. Torsion differentials are most prominently featured in the HMMWV and some commercial Hummer vehicles, and as a center differential in some allwheel drive systems, such as Audi's Quattro. Very heavy trucks, such as those used to carry aggregates, often use a worm gear differential for strength. The worm drive is not as

efficient as a hypoid gear, and such trucks invariably have a very large differential housing, with a correspondingly large volume of gear oil, to absorb and dissipate the heat created. Worm drives are used as the tuning mechanism for many musical instruments, including guitars, double- basses, mandolins, bouzoukis, and many banjos A worm drive tuning device is called a machine head .Plastic worm drives are often used on small battery-operated electric motors, to provide an output with a lower angular velocity than that of the motor, which operates best at a fairly high speed. This motor-worm-gear drive system is often used in toys and other small electrical devices worm drive is used on jubilee-type hose clamps or jubilee clamps. The tightening screw's worm thread engages with the slots on the clamp band. Occasionally a worm gear is designed to run in reverse, resulting in the output shaft turning much faster than the input. Examples of this may be seen in some hand-cranked centrifuges .

## V. 3D MODEL OF COMPONENTS

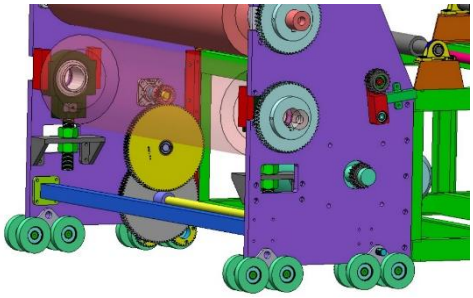

**Figure.5. Extruder Base**

## V1. 3D VIEW OF FULL SETUP

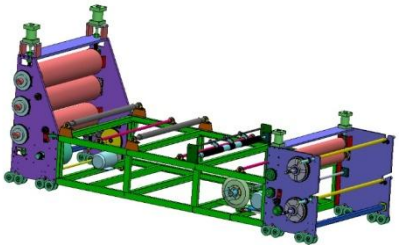

**Figure.6. Extruder**

## VII. ADVANTAGES

1. Extruder is made into portable by integrating the gear setup in the base region.
2. Die length is increased.
3. Production rate is also increased
4. Maintenance work can be done easy by porting and do not need crane to lift the components.

## VIII. DISADVANTAGES

1. Initial setup cost is high.
2. Design process is more complicated

## IX. APPLICTIONS

1. This method can be used in all extruder machines.
2. It can be widely used in small scale machinery.

## X. CONCLUSON

From our project we conclude that extruder base can be made into portable without changing the bases and frames by lifting it. It can be done by setting the spur gear drive in the base region as shown in the above figure. It is succefully fabricated and introduced in the extruder.

## XI. REFERNCES


[1].Hsieh, F. Peng, I.C. and Huff, H.E. (2010). Effects of PBT and screw speed on processing and product variables of corn meal extruded with a twin–screw extruder. Journal of Food Science 55, 224–227.

[2]. Lawton, B.T., Henderson, G.A. and Derlatka, E.J. (2011).The effects of extruder variables on the gelatinization of polymer effect. Canadian Journal of Chemical Engineering 50, 168–172

[3]. W. Hale, L. A. Pessan, H. Keskkula, and D. R. Paul, Effect of compatibilization and ABS type on properties of PBT/ABS blends, Polymer 40 (15), pp. 4237–4250, 1999, doi:10.1016/ S0032-3861(98)00670-3

[4]. Guha, M., Zakiuddin, S. and Bhattacharya, S. (1998). Effect of barrel temperature and screw speed on rapid visco analyzer pasting behavior or rice extrudes, International Journal of Food Science and Technology 33, 259–266 (2009)

[5]. C. Teixeira, J.A. Covas, and A. Gaspar-Cunha, A global modelling program for co-rotating twin-screw extruders," PPS 26 – Proceedings of the Polymer Processing Society Annual Meeting, (2010)

[6]. A Harlin, Quantitative analysis of twin screw extruder performance in stabilization multiple objective ant colony optimization algorithms for the bi-criteria TSP. European J. Oper. Res., 180:116–148, (2007)