# Review Paper on Process Parameters for Extrusion Machine during Expanded Polystyrene Foam Manufacturing

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***Abstract:*** Recent tread of technology require advanced machinery for large amount of application and reduced human effort as per technology concern. In these review paper to identify different varies of expanded polystyrene form manufacturing machine for specific application. Review base on identified different parameter of machine which is helpful to maintained final product from machine. The literature survey reflected number research paper shows different parameters likes speed of screw, feed rate of molten material and temperature of polystyrene mater according final product solidification. The data of process parameters are optimization by using different approaches like practical data analysis and factorial method to justified optimum value of optimum data which should be useful to fine production. The summery of each every paper mention to gives detail about process parameters of extrusion machine.

***Index Terms*–Process Parameters, Advanced Manufacturing Process, Feed rate, Speed, Temperature.**

## 1. Introduction

Extrusion cooking was first introduced in food and feed processing in the late 1950s. Since then, the systems involved have grown in popularity, efficiency, and flexibility. Extrusion cooking technology is mostly used for cereal and protein processing in the food industry and is closely related to the pet food and feed sectors. In the last decade, the development of extruders has evolved to yield sophisticated products, new flavor generation, encapsulation, and sterilization.

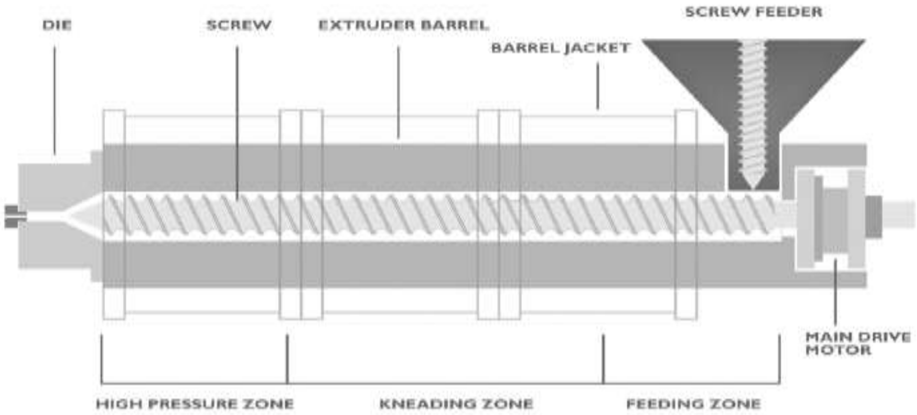


Fig. 1: Schematic representation of an extruder including its main parts and zones

The use of thermoplastic extrusion in food processing is facilitated by the dynamism of extruders, which can be divided into two types: single-screw and twin-screw extruders (Riaz, 2000).
Extruders are composed of five main parts: (i) the pre-conditioning system; (ii) the feeding system; (iii) the screw or worm; (iv) the barrel; (v) the die and the cutting mechanism (El- Dash, 1981), which can be seen in Figure 1. Also, they can vary for screw, barrel, and die configuration.

## 2. Literature Survey

S.A. Oke et al in 2002 **[1]** studied and optimized the flow rate of the extrusion process with the application of a neuro-fuzzy model. The model identifies a specified desired output from a large number of input parameters. The methodology adopted is neuro-fuzzy. The result obtained indicates the feasibility of applying the methodology in this instance. They predicated on the need to attain more precision in the derivation of optimal values for the plastic extruder system in the recycling plant. Before the emergence of this paper, it seems that no documentation has addressed the problem of extruder flow process optimization in a plastic recycling system. This is new knowledge that the article is proposing but not yet documented until now. The article is worth knowing given the economic implication that it has in the industry. With the application of the model, it may be feasible to find an optimal value of the flow rate of an extruder in a plastic recycling system. Given the uncertainties that may exist in the measurement of the flow rate and its associated parameters, and from the practical case example demonstrated in this paper, it is obvious that some conclusions useful for interpreting the results are helpful. The validity of the conclusion is assisted by the empirical data that are used to test the model. The future holds many promising results in the improvements of the existing model. The application of hybrids of genetic algorithms and artificial neural networks, genetic algorithms, and fuzzy logic will open a new stream of research that would engage researchers for several decades to come.

S.Ravi and P.A.Balakrishnan in 2009 **[2]** developed a Genetic Algorithm based Fuzzy Logic Controller for temperature control in plastic extrusion and tested through a simulation study. A novel GA based FLC method was implemented to design a practicable advanced controller. The manifest feature of the proposed method was the smoothing of the undesired control signal of the Mamdani type FLC controller. The plastic extrusion system is generally nonlinear and the temperature of the plastic extrusion system may vary over a wide range subjected to various disturbances. The system was designed with two different control techniques to control the temperature at different set point changes and as well as to control sudden input disturbances. Due to sudden input disturbances and different set points temperature changes for the plastic extrusion system, the simulation results show the FLC control is with little overshoot and takes a delay to settle with a reference value. The genetic Algorithm controller FLC tuning is without overshoot and settles very quickly compared with the FLC controller. This paper demonstrates the effectiveness of an intelligent controller on a non-linear system particularly for temperature control in a plastic extrusion system. The proposed controller identifies the process variations quickly and provides good control for the set point changes and sudden disturbances. The Genetic Algorithm based FLC controller will prove especially efficacious in plastic extrusion system.

Leong Ping Tan et al. (2004), **[3]** proposed the applications of soft computing to deal with the constraints in conventional modeling techniques of the dynamic extrusion process. The proposed technique increases the efficiency in utilizing the available information during the model identification. The resultant model can be classified as a 'grey-box model' or has been termed as a 'semi-physical model' in the context. The extrusion process contains several parameters that are sensitive to the operating environment. The fuzzy rule-based system (FRBS) is introduced into the analytical model of extrusion through sub-models to approximate those operational-sensitive parameters. In drawing an optimal structure for each sub-model, a hybrid algorithm of a genetic algorithm with a fuzzy system (GA-fuzzy) has been implemented. The optimized structure with a smaller number of membership functions and rules would help to increase the interpretability while avoiding the problem of over-parameters. Besides, the speed of simulation would also improve as the sub-models contain fewer parameters. The model was first evaluated based on consistency with the theoretical analysis. The model predictions in general adhered to the theory when step changes in the manipulating parameters such as the screw speed were simulated.

The context of the study of Régis Baron et al. 2010 **[4]** was the modeling of the reactive extrusion process based on an alginate extraction protocol. Residence Time Distribution (RTD) is one important part to predict the kinetics of reactive compounds. They proposed a model to predict RTD in fully intermeshing co-rotating twin-screw extruders without reaction. The model was based on the extension of an axial dispersion model, including control parameters (screw speed and flow rate) and geometrical parameters (screw profile and die design). Simulations were performed for various operating and geometrical conditions to illustrate the possibilities offered by the proposed model. Validation was conducted for two different extrusion applications, seaweed extrusion, and polymer extrusion. In this paper, a new model is proposed to predict residence time distribution in fully intermeshing co-rotating twin-screw extruders, taking into account control parameters (screw speed and flow rate) and geometrical parameters (screw profile and die design). The possibilities offered by the proposed model were illustrated by simulations for various operating and geometrical conditions. Validation was performed for two different applications, seaweeds extrusion, and polymer material extrusion. It showed the model's ability to predict RTD for various kinds of extruded materials. The originality of the proposed model lies in its ability to predict RTD after adjusting only one parameter ($\lambda_1$) thanks to a unique experimental RTD curve.

The plastic extrusion process with water cooling is a variable structure system in nature. To implement discrete-time variable structure control, three important problems are considered. They are the choice of dynamic sliding surface for a system with a relative degree greater than one, computation of the discrete-time dynamic sliding surface variable, and self-tuning of the switching control magnitude to reduce chatterings. A simplified lumped parameter model was constructed by Wu-Chung Su and Ching-Chih Tsai in 2001**[5]** to decouple the original multichannel system into multiple single-channel subsystems. The Plastic Extrusion process with water cooling is an inherent VSS. It is very suitable to employ VSC for temperature control problems. We have proposed a discrete-time VSC method for the PC-based system. Since the barrel temperature dynamic equations have a relative degree higher than one, a dynamic sliding operator is proposed instead of a static one to ensure the reaching of sliding mode. For discrete implementation, the sliding surface variable is computed from a discredited equation of the sliding operator using zero-order hold. The associated discrete-time dynamics of is stable for all sampling period. Without the discretization process, an error due to Euler approximation will occur, leading to worse system response. Finally, a self-tuning VS control law is used to alleviate chatterings. This is especially important when the system reaches the set point temperature. With a reduced heating and cooling energy, the system trajectory wills remaining a close neighborhood of the sliding surface. Steady-state error can be reduced significantly. The experimental results demonstrated the effectiveness of the proposed methods.

In 2009, the process of polyethylene extrusion and various types of extruders were studied by S. A. Razavi Alavi et al. In the process of polyethylene extrusion polymer material similar to powder or granule is under compression, melting, and transmission operation and on the base of special form, extradites has been produced. Twin-screw extruders are applicable in industries because of their high capacity. The powder mixing with chemical additives and melting with thermal and mechanical energy in three zones (feed, compression, and metering zone) and because of the gear pump and screw's pressure, converting to the final product in the latest plate. Extruders with twin-screw and the short distance between screws are better than other types because of their high capacity and good thermal and mechanical stress. In this paper, the process of polyethylene extrusion and various tapes of extruders are studied. It is necessary to have exact control over the process of producing high-quality products with safe operation and optimum energy consumption. The granule size is depending on the granulator motor speed. Results show at a constant feed rate a decrease in granule size was found whit an Increase in motor speed. It is necessary to have exact control over the process of producing high-quality products with safe operation and optimum energy consumption. The granule size is depending on the granulator motor speed. Results show at a constant feed rate a decrease in granule size was found with an increase in motor speed. Relationships between HDPE feed rate and speed of granulator motor, main motor, and gear pump were calculated **[6].**

Rina Chokshi and Hossein Zia (2004) reviewed the Hot-Melt extrusion process in the context of a pharmaceutical manufacturing operation in detail. Hot-melt extrusion is one of the most widely applied processing technologies in the plastic, rubber, and food industry and now it has found its place in the array of pharmaceutical manufacturing operations. Today melt extrusion technology represents an efficient pathway for the manufacture of drug delivery systems. Resulting products are mainly found among semi-solid and solid preparations. The potential of the technology is reflected in the wide scope of different dosage forms including oral dosage forms, implants, bio adhesive ophthalmic inserts, topical films, and effervescent tablets. Also, the physical state of the drug in an extrudate can be modified with help of process engineering and the use of various polymers. The drug can be present in crystalline form for sustain release applications or dissolved in a polymer to improve the dissolution of poorly water-soluble drugs. The possible use of a broad selection of polymers starting from high molecular weight polymers to low molecular weight polymers and various plasticizers has opened a wide field of numerous combinations for formulation research. Drawbacks of the technology are often related to high energy input mainly related to shear forces and temperature. This is where process engineering becomes significant. The design of screw assemblies and extruder dies are two major areas, which have a significant impact on product quality and degradation of drugs and polymers. Drugs that are sensitive to elevated temperatures can be processed successfully when the residence time is short compared to conventional processes like sterilization. Work in this field is increasing and the literature published reveals many novel and interesting aspects of this technology such as in-situ salt formation, fast dispersing systems with foam-like structures, complex formation in the melt, and nano particles released from molecular dispersions manufactured by melt extrusion. **[7].**

J. Carl Pirkle Jr and Richard D.Braatz (2010) studied and presented that stable operating regions for blown film extrusion are mapped using a dynamic model that includes the effect of crystallization on the rheological properties of the polymer. For a given bubble air mass, the take-up ratio was used as the continuation parameter for mapping steady-state solutions. The take-up ratio varies smoothly, but not necessarily monotonically, with the machine tension. A corresponding decline occurs, however, in the thickness reduction of the blown film for a given blow-up ratio. Stable operating regions for blown film extrusion are mapped using a dynamic model that includes the effect of crystallization on the rheological properties of the polymer. In the computations, the bubble air mass and take-up ratio were held constant, and the machine tension and bubble inflation pressure were treated as dependent variables. For a given bubble air mass, the take-up ratio was used as the continuation parameter for mapping steady-state solutions. The take-up ratio varies smoothly, but not necessarily monotonically, with the machine tension. Curves of either blow-up ratio or thickness reduction versus take-up ratio reveal that there are take-up ratios where no, one, or multiple solutions exist. The heat transfer coefficient from the polymer film to the external air and surroundings has a marked influence on the qualitative and quantitative features of the blow-up ratio versus thickness reduction curves. Generalized eigen value analysis of the linearized blown film equations indicates that increasing the heat transfer rate increases the stability of operations. A corresponding decline occurs, however, in the thickness reduction of the blown film for a given blow-up ratio. **[8].**

Krzysztof LEWANDOWSKI et al.(2011) determined the influence of processing temperature of polyvinyl chloride and its blends with wood filler (PVC/WF) on characteristics of both injection molding and extrusion processes as well as on selected mechanical properties of obtained materials. The increase of processing temperature improves the mechanical properties of PVC and PVC/WF composites obtained during both extrusion and injection molding processes. Polyvinyl chloride and its composites processed by injection molding method are characterized by better values of mechanical properties. These changes result from the increase of PVC gelation degree [14, 15]. The investigation's results of extrusion and injection molding processes illustrate what kind of problems potential producers of WPC composites with PVC matrixmay expect. Thus, the conducted research indicates that the application of dry blend with proper content enables the processing of PVC/WF composites in the whole range of temperature proposed above by the use of classical processing tools. **[9].**

The mechanical properties of polypropylene random copolymer (PP-R) with different processing parameters were studied and with special attention investigated the influence of master batch addition on the variation in the mechanical properties of injection-molded PP-R. Tensile, instrumented Charpy impact, Shore D hardness, differential scanning calorimeter (DSC), and Vicat softening temperature (VST) tests were conducted on the test samples containing different color by Senol Sahin and Pasa Yayla in 2005 **[10].** The effect of processing parameters on material performance was studied on samples that were directly obtained from extruded pipes and on injection molded samples and finally the effects of storage time on the polymer properties were investigated.

Patrick C. Lee et al. studied and investigated visualizing the expansion behavior of butane-blown foam. They studied various kinds of visualization technologies. **[11].**

The effect of the extrusion coating conditions on the structure and tensile properties of some polyethylene grades (films) was evaluated by Nils Toft and Mikael Rigdahl in 2002 **[12].** Process-related factors that may influence the degree of orientation of solidified extrusion coated polymer films are the elongational strain rate, the melt temperature (via the melt rheology), and the cooling rate (time of solidification). The results arrived here point to that the degree of orientation, measured as shrinkage, is to a large extent governed by the elongational strain rate. This implies that if the influence of the film thickness is accounted for, that the processing parameters, which determine the elongational strain rate (such as the machine speed, the air gap, and the draw ratio), will affect the degree of orientation rather significantly. The elongational strain rate imposed during the drawing step then will constitute an important tool for the manufacturer when aiming at controlling the structure and properties of the final product. Changing the melt temperature effects as expected the degree of orientation, and the controlling parameter is likely to be associated with the elongational viscosity of the melt. A lower elongational viscosity (higher temperatures) is likely to be less effective in producing a highly oriented structure. This certainly implies that the rheological properties of the melt, as reflected for instance in the elongational viscosity have a direct effect on the solid-state behavior of the final film. If further work is performed it may possible to establish a direct correlation between the elongational viscosity, via orientation measurements and evaluation of the morphology, and the film properties. This is however beyond the scope of the present study. A clear result from this study is that the strain at break in MD is strongly related to the degree of orientation as given by the shrinkage. Thus at a given melt temperature, the ultimate strain is governed by the elongational strain rate and the processing conditions that control this variable during the drawing operation. Considering the relation between the strain at break and the strength of the films for the polymers used here, the elongational strain rate appears to be a valuable concept for the manufacturer when aiming at controlling the ultimate mechanical properties of the film. Once again it should be made clear that the used elongational strain rate (and the elongational viscosity) can provide useful information on how the orientation of the specimens will be affected by changes in the processing conditions during the extrusion coating. It will however not provide a quantitative tool for predicting how the physical properties of different polyethylene grades will be changed. For a given polymer grade, such relations may however possibly be established.

Vikash Agarwal et al. studied and investigated in 2012, the optimization parameters of the extrusion blow molding process for making a plastic container of high-density polyethylene grade B6401 (HDPE) produced by the Mitsui CX processed at HALDIA PETROCHEMICAL LTD. An optimal parameter combination of the Extrusion blow molding process was obtained by Grey relational analysis. By analyzing the Grey relational grade, the degree of influence for each controllable process factor onto individual quality targets can be found. Additionally, the analysis of variance (ANOVA) has been also applied to identify the most significant factor [13].The Grey relational analysis based on an orthogonal array of the Taguchi method was a way of optimizing the parameter of the blow molding process for the manufacturing container of HDPE (B6401). The analytical results are summarized as follows:

1. From the response table of the average Grey relational grade, it is found that the largest value of the Grey relational grade for the screw temperature of 140 ºC, the blowing time of 15 seconds, and the cooling/exhaust time of 5 seconds. It is the recommended levels of the controllable parameters of the extrusion blow molding process as the maximization of the compressive strength of the container and minimization of volume error are considered.
2. Through ANOVA, the percentage of contribution to the extrusion blow molding process, in sequence, is the blowing time, the screw temperature, and the cooling/exhaust time.

Hence, the blowing time is the most significant controlling factor for the extrusion blow molding process when the maximization of the compressive strength and the minimization of the volume error is considered.

Multi-point thermoforming is a new flexible technique for manufacturing three-dimensional polymer sheet parts. The fixed die utilized in the conventional thermoforming process is replaced by a multi-point die, which can be reconfigured rapidly and nearly cost-free. Junhui Cao et al. in 2014 studied and the effects of the elastic conditions on the surface quality and shape accuracy of the formed work piece have been investigated through experiments and numerical simulations. The results show that an elastic cushion with proper thickness and hardness can significantly improve the surface quality of the work piece. It has also been found that the application of lubrication can improve the shape accuracy of the formed work piece.
G'sell and Jonas model was used, and material parameters of the model were fitted to capture the behavior of PMMA in the numerical simulations for the MPTF process. A series of simulations and experiments have been performed to investigate the influence of the parameters relating to the elastic cushion on the surface quality and shape accuracy of the formed work piece. The following results are obtained:

1. The application of the elastic cushion could suppress the dimpling in the MPTF process. The surface quality of the work piece has been significantly improved by increasing the thickness of the elastic cushion.
2. The excessive thicker elastic cushion will require higher forming pressure of MPTF and will reduce the shape accuracy of the formed work piece. Considering the surface quality and shape accuracy of the work piece, 15mm is the optimum elastic cushion thickness for the PMMA sheet mentioned in this paper.
3. Having the same thickness, the softer elastic cushion could improve the surface quality and shape accuracy of the work piece. The polyurethane with a hardness of Shore 60A has been chosen as the elastic cushion in the present work.
4. The application of the lubrication will improve the shape accuracy of the work piece and make the thickness of the work piece more uniform. **[14]**

Spectroscopic techniques such as Raman, mid-infrared (MIR), and near-infrared (NIR) have become indispensable analytical tools for rapid chemical quality control and process monitoring. S. E. Barnes et al. in 2005 presented the application of in-line Fourier transform near-infrared (FT-NIR) spectroscopy, Raman spectroscopy, and ultrasound transit time measurements for in-line monitoring of the composition of a series of high-density polyethylene (HDPE)/polypropylene (PP) blends during single-screw extrusion. Spectroscopic techniques such as Raman, mid-infrared (MIR), and near-infrared (NIR) have become indispensable analytical tools for rapid chemical quality control and process monitoring. This paper presents the application of in-line Fourier transform near-infrared (FT-NIR) spectroscopy, Raman spectroscopy, and ultrasound transit time measurements for in-line monitoring of the composition of a series of high-density polyethylene (HDPE)/polypropylene (PP) blends during single-screw extrusion. Melt composition was determined by employing the univariate analysis of the ultrasound transit time data and partial least squares (PLS) multivariate analysis of the data from both spectroscopic techniques. Each analytical technique was determined to be highly sensitive to changes in melt composition, allowing accurate prediction of blend content to within ± 1% w/w (1σ) during monitoring under fixed extrusion conditions. FT-NIR was determined to be the most sensitive of the three techniques to changes in melt composition. A four-factor PLS model of the NIR blend spectra allowed the determination of melt content with a standard prediction error of ± 0.30% w/w (1σ). However, the NIR transmission probes employed for analysis were invasive into the melt stream, whereas the single probes adopted for Raman and ultrasound analysis were noninvasive, making these two techniques more versatile. All three measurement techniques were robust to the high temperatures and pressures experienced during melt extrusion, demonstrating each system's suitability for process monitoring and control. **[15].**

A thermocouple mesh technique measured melt temperature radially across polymer flows, precisely profiling the relationship between melt behavior and processing parameters in polymer extrusion. Chamil Abeykoon et al. in 2012 generated 2D temperature maps of melt temperature with data from a thermocouple mesh technique **[16].** Chamil Abeykoon et al. also discussed the energy conservation of an extruder and described the energy and thermal efficiencies in polymer extrusion. In 2014 they explored the correlation between energy demand and thermal stability, radial temperature fluctuations of the melt flow in extrusion. They discussed energy consumption and losses in polymer extrusion and compared energy consumption in polymer extrusion at different conditions. Empirical models on extruder energy consumption are provided and computer modeling of energy consumption of polymer extrusion is performed.

Ryan Gosselin et al.in 2011 examined the ability of chemometrics methods, namely multivariate image analysis (MIA) and Grey Level Co-occurrence Matrix analysis (GLCM), to extract meaningful information from visible and near-infrared spectral images of extruded wood/plastic composite materials for predicting Spatio-temporal variations in their properties. The samples were produced under varying process and feed conditions according to designed experiments. The samples were produced under varying process and feed conditions according to designed experiments. Mechanical properties of the samples were measured using standard analytical methods both during steady-state and dynamic transition periods. A Bootstrap-PLS regression technique was first used for selecting the spectral bands (i.e. wavelengths) that were the most highly correlated with the material properties. In a second step, a more parsimonious PLS regression model was built between the spectral and textural features extracted from the lower dimensional spectral images and the corresponding quality properties of each sample. The imaging sensor was able to simultaneously monitor 7 properties in both steady-state operation and during transitions **[17].**

A simple real-time energy monitoring and feedback control method based on fuzzy logic has been developed and validated by Jing Deng et al. in 2014, for polymer extruder. The effect of process settings on energy consumption has been investigated. Polymer extrusion, in which a polymer is melted and conveyed to mold or die, forms the basis of most polymer processing techniques. Extruders frequently run at non-optimized conditions and can account for 15–20% of overall process energy losses. In times of increasing energy efficiency, such losses are a major concern for the industry. Product quality, which depends on the homogeneity and stability of the melt flow which in turn depends on melt temperature and screw speed, is also an issue of concern of processors. Gear pumps can be used to improve the stability of the production line, but the cost is usually high. Likewise, it is possible to introduce energy meters but they also add to the capital cost of the machine. Advanced control incorporating soft sensing capabilities offers opportunities to this industry to improve both quality and energy efficiency. Due to strong correlations between the critical variables, such as the melt temperature and melt pressure, traditional decentralized PID (Proportional–Integral–Derivative) control is incapable of handling such processes if stricter product specifications are imposed or the material is changed from one batch to another. New real-time energy monitoring methods have been introduced without the need to install power meters or develop data-driven models. The effects of process settings on energy efficiency and melt quality are then studied based on developed monitoring methods. Process variables include barrel heating temperature, water cooling temperature, and screw speed. Finally, a fuzzy logic controller is developed for a single screw extruder to achieve high melt quality. The resultant performance of the developed controller has shown it to be a satisfactory alternative to the expensive gear pump. The energy efficiency of the extruder can further be achieved by optimizing the temperature settings [18]

Santosh Kumar and Prasad presented in 2004 a feature-based approach for the design of extrusion dies. Part drawing of the given shape to be extruded is drawn using line, arc, circle, polyline, and ellipse entities of AutoCAD Rel-12, and the corresponding DXF file is created. The result obtained agrees well with the experiment and the theoretical analysis. The paper has been combined with a rigid-plastic finite element (RPFE) model (Kumar and Prasad; J. Prod. Eng. (2003)) for steady-state axisymmetric hot extrusion using the kinematically admissible velocity field obtained from the upper-bound model as proposed in Kumar et al. (Trans. ASME J. Manuf. Sci. Eng. 126 (1) (2002) 71). Based on the optimal power obtained from the upper-bound method (Int. J. Prod. Res. 37 (1999) 2519) the temperature distribution in cold as well as hot extrusion process has been determined to study the effect of process parameters such as ram velocity, reduction, friction between die–billet interface, die length and temperatures (initial billet, die, and container and surrounding). The result obtained agrees well with the experiment and the theoretical analysis **[19].**

In 2014, by Javier Vera-Sorroche et alduring their research work, a highly instrumented single screw extruder has been used to study the effect of polymer rheology on the thermal efficiency of the extrusion process. Three different molecular weight grades of high-density polyethylene (HDPE) were extruded at a range of conditions. Three geometries of extruder screws were used at several set temperatures and screw rotation speeds. The extruder was equipped with real-time quantification of energy consumption; thermal dynamics of the process were examined using thermocouple grid sensors at the entrance to the die. Results showed that polymer rheology had a significant effect on the process of energy consumption and thermal homogeneity of the melt. The highest specific energy consumption and poorest homogeneity were observed for the highest viscosity grade of HDPE. Extruder screw geometry set extrusion temperature and screw rotation speed was also found to have a direct effect on energy consumption and melt consistency. In particular, specific energy consumption was lower using a barrier flighted screw compared to single flighted screws at the same set conditions [20].

## 3. Conclusion

It was reflected on functional base operation likes increase product quality and optimization of different process parameter by using different method of optimization etc.

Some research paper indicated about different types of high-density polyethylene (HDPE) and other plastic material etc.

Some research paper indicated about different technologies use for manufacturing system by using different types of control which useful to control molten metal in barrel screw by uniform transform material from heating coil to working area.

There is possibility of work in direction core component design and analysis process for different type of extrusion process machine with respect to final product shape and size.

The review of different research indicated to serve research with respect to verified different mathematical model with practical data so indentified proper optimization data with respect practical data.

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