The feed rate of the polymer powder for twin-screw extruders is generally controlled by the rate at which the powder is metered into the hopper. The hopper is generally considered to run "empty" by which is meant without significant volume of powder therein and without "hold-up" of the powder at the base of the hopper. To date the feed port area has not generally been limiting on the process, and therefore has not caused a great deal of concern.

However, it has now been found that as capacity increases, and even though the feed port area is generally increased (by proportional increases in its width and length) as the screw and barrel sizes are increased, the feed port area increases only in a squared mathematical relationship whereas the throughput increases in a cubic relationship, and there becomes an issue that the polymer does not feed into the barrel through the feed port at a rate fast enough to fill the barrel sufficiently. This issue is especially significant for feedstocks with poor flowability.

Thus, in order to meet the continued requirements for higher capacity it is necessary to design an extruder which has an increased polymer feed capability compared to prior art extruders.

Summary

Thus, in a first ~~aspect~~embodiment the present ~~invention~~disclosure provides an extruder comprising:

(i) two or more barrel sections arranged sequentially from:

(a) an upstream feed barrel section to which polymer feedstock to be extruded is fed, the upstream feed barrel section containing two or more screws each having a diameter of X; to

(b) a downstream barrel section from which melted polymer is passed to a die and extruded; and

(ii) one or more feed ports for feeding polymer feedstock to be extruded into the extruder at its upstream end,

**characterised in that** the total area of the one or more feed ports through which polymer feedstock is introduced is greater than $4*X^2$.

In an aspect, the present disclosure provides a process for extrusion of polymer comprising feeding a polymer feedstock to a feed port of an extruder, said extruder comprising:

(i) two or more barrel sections arranged sequentially from:

(a) an upstream feed barrel section to which polymer feedstock to be extruded is fed, the upstream feed barrel section containing two screws each having a diameter of X; to

(b) a downstream barrel section from which melted polymer is passed to a die and extruded; and

(ii) the feed port for feeding polymer feedstock to be extruded into the extruder at its upstream end,

wherein (a) the polymer feedstock is a polymer of ethylene or propylene and is in the form of a powder having a flowability ratio of from at least 1 to less than 6, said flowability ratio of the polymer powder being measured using the instantaneous shear test described in ASTM D 6773-02 at a consolidation pressure of 2000 Pa and at a temperature that is equal to the temperature of the polymer powder at the feed port during the extrusion process,

(b) the diameter of the screws in the feed port barrel section of extruder is 200 mm or greater, and

(c) the feed port area is a rectangular shape with width limited by the width of the upstream feed barrel section to up to 2*X and with a length greater than 2.5*X and the total area of the feed port through which polymer feedstock is introduced is greater than $5*X^2$.

Detailed Description

The present invention relates to extruders having multiple (two or more) screws. The screws are provided in parallel (or close thereto) and may rotate in the same or opposite directions in use (known respectively as co-rotating or counter-rotating). The screws may be non-intermeshing, partially intermeshing, or fully intermeshing.