




Caleva Extruders and Spheronizers for
Production and Product Development,
Serving Industry World-wide

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Extrusion method if your product is sensitive to heat

Your material may be sensitive to heat and the temperature during extrusion must be kept within certain limits. The reality is that all extrusion processes are based on the generation of pressure within the material and when materials are put under pressure heat is generated. This cannot be avoided but different extrusion types generate different amounts of heat.

Extrusion types/methods:

There are basically three different types of extruder and the one that you choose will have far reaching implications on the production operations that you plan for the future. It is vitally important that you make the right choice.

In summary.....

Screw driven extruders (with radial or axial output)

Screw driven extruders move the product to the extrusion die head along an axis by the use of a screw thread. The product is worked hard for quite a long time and it is a fact that this process generates a huge amount of heat. This cannot be avoided and all screw extruders do this. The generation of heat is useful in many industries such as plastics or food but for pharmaceutical products or any other products that can be damaged by heat this can be a disaster. This is especially true when high volumes and continuous extrusion are required.

It is possible to add cooling systems to screw driven extruders but these are often not very efficient at keep the product cool during the process even though they may keep the equipment cool!

Caleva's recommendation is that screw driven extruders should be avoided if there are restrictions on the amount of heat that may be generated. This is particularly true if you want to extrude product through very small holes (if very small pellets are required - the diameter of the final pellets is largely determined by the diameter of the extrudate you will be extruding through small holes in the extrusion die.)

Basket or screen extruders:

There are two main types of mechanism. One scrapes the product through the screen and the other type uses rollers that push the product through the screen. The type with the roller action is marginally gentler on the product but both types do generate some heat.

The heat generated in screen extruders is significantly less than the amount of heat generated with screw driven extruders. Screen extruders are generally suitable for a great number of pharmaceutical formulations and they are widely used in the pharmaceutical industry. They are also the lowest cost extruder to make for any particular required capacity. This is why they are widely used.

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However they are still not the most suitable for products that are very sensitive to heat.

Gear Extruders:

Gear extruders are less well known but have significant and real advantages when extrudate is required of products that are sensitive to heat.

The principle of operation is quite different to other extruders. The product is allowed to fall between two rotating gears. The base of the gear form has holes so that the product is pushed through the base of each gear tooth into the hollow centre of the gear and falls out of the front of the gear.

A small film of how gear extruders operate can be downloaded from here

<https://dl.dropbox.com/u/107900850/Extruder%2040%20gear%20mechanism.avi>

This process is the type of extrusion that generates the least possible amount of heat. This low generation of heat is principally for three reasons;

1. Very little work is done to the product before it enters the extrusion teeth and the actual moment when the product is pushed through the holes in the die. You can see this on the film that can be downloaded here
<https://dl.dropbox.com/u/107900850/Product%20inflow%20into%20gear%20extruder%20gears.wmv>
2. The product moves through the extrusion holes very quickly and emerges into the centre of the gear. Because the extrusion is very quick and the time the product is under pressure is short very little heat is generated. A film of extruded product coming out of the centre of the gears can be downloaded here
<https://dl.dropbox.com/u/107900850/Extruder%2040%20Gear%20extruder%20-%20Product%20outflow.wmv>
3. Finally because the gears themselves are significantly large and solid lumps of steel any small amount of heat generated is easily transferred away. The point of extrusion in both screw fed and screen extruders is much less solid and therefore the transfer of heat away from the product is significantly slower.

If you would like to see a film of how a small gear extruder works in practice one can be downloaded from here

<https://dl.dropbox.com/u/107900850/Extruder%2040.wmv>. This film is about 350 mb but if you have never seen a gear extruder operating then it would be worthwhile downloading. This machine is a smaller one for development work but works on the same principle as the larger machines.

We have provided above a brief overview of why, where a product is sensitive to heat we would strongly recommend that you should **ONLY** consider using a gear extruder.

