

Smart Note

Q A

Q. How do I best incorporate sensitive or low bulk density fillers in my polymer compound?

A. Use side feeding option with the Thermo Scientific™ Process 16 Twin-screw Extruder

Challenge

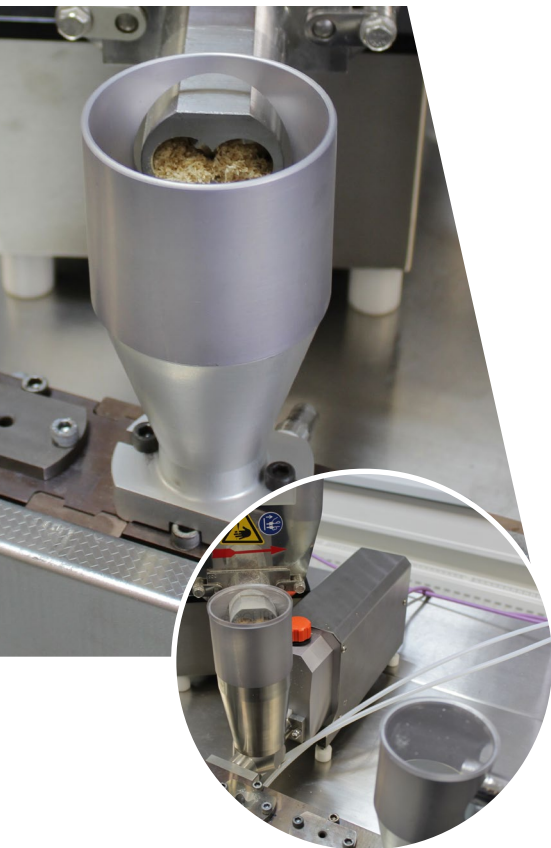
Twin-screw compounding is the technique of choice to create new polymer compounds with tailored properties by embedding fillers, reinforcing agents, pigments, flame retardants, fibers, etc. into a base polymer matrix.

Some mechanically sensitive additives cannot be fed at the beginning of the process as they may degrade if they undergo the whole compounding process.

Other ingredients, such as wood fibers, have very low bulk-densities. Adding them at the beginning of the process may prohibit the necessary amount to be incorporated into the compound.

These challenges can be overcome by adding secondary feeding to the process following the melting of the main polymer matrix. This can be achieved from the top or with side feeding.





Solution

The Process 16 Twin-screw extruder offers a fully ported barrel with 6 top feeding ports and 4 side feeding locations for the secondary feeding of sensitive or low bulk density materials. Up to 2 side feeding locations can be utilized simultaneously.

Top feeding can be a straightforward solution for a large range of materials and usually works well if process requirements are not too demanding.

Side feeding is preferred if a large volume (amount) of material is required or if the material has a low bulk density. Moreover, side feeding can also prevent the clogging of the feed funnel in the above mentioned cases.

To demonstrate the advantages of side feeding, two compounding trials were carried out under the same extrusion conditions. The difference between these trials was in the way the filler, a low bulk density wood fiber, was introduced into the extruder.

The aim of these trials was to compare the amount of wood fibers that could be fed into a constant stream of melted polymer using secondary top feeding and side feeding setups.

Equipment used and test setup

- 16 mm twin-screw extruder, Thermo Scientific Process 16
- Gravimetric single-screw feeder for polymer pellet feeding
- Gravimetric twin-screw feeder for wood fiber feeding (Test 1)
- Side-Feeder (Test 2)

Test setup 1:	Test setup 2:
Primary feeding of polypropylene pellets 08 kg/hr into feed port #1.	Primary feeding of polypropylene pellets 08 kg/hr into feed port #1.
Secondary top feeding of wood fiber into feed port #4.	Secondary side feeding of wood fiber between top port #3 and port#4 from the backside of the barrel.

 [See for yourself. Watch the wood fiber trial.](#)

Results

Test setup #1: The top-feeding port clogged when the throughput of wood fiber exceeded 0.2 kg/hr.

Test setup #2: The feed rate of wood fiber could be increased up to 1.5 kg/h before the extrusion process reached its (torque and pressure) limits.

Conclusion

Side feeding is the best choice when a large quantity of low-bulk density material needs to be incorporated into a polymer compound.

Find out more at thermofisher.com/process16

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