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I thought I had invented something, when presented with the prospect of replacing a damaged feed throat and barrel, I chose to design a barrel with an integral feed throat and get both for the price of one. Well, I wasn't the first to think of this. There are O.E.M.s who do just that, Wayne Extruders, for example. What are the practical aspects associated with integrating the feed throat into the barrel? In short, there are a number of good reasons to do this.

Most extruders have a separate "bolt on feed throat". At first, this appears to make a lot of sense:

— easy to swap out feed throat if worn or damaged
— easy to exchange different feed throat geometries, such as grooved feed
— water cooling jacket can be installed directly into the feed throat section

Sounds like the right choice! However, there is a hidden serious engineering flaw in this design. Barrels and screws are manufactured with very tight tolerances. A small extruder barrel may have bore tolerances of plus a thousandth, minus nothing and the matching screw, minus 2 thousandths below the nominal barrel size. One might assume that these dimensions would also be applied to the feed throat bore. Designing a larger bore in the feed throat would introduce a radial step that would inhibit pellet conveying into zone one!

The problem, however, is one of alignment between the barrel and feed throat. It now becomes almost impossible to mate the feed throat to the barrel, without some concentric or axial misalignment, and this leads to an interference fit between the feed throat and the screw. This causes "feed throat galling". Add to this the use of soft metals for the feed throat bore and you have a recipe tailor-made for feed throat galling. Ever seen this?

Some extruder manufacturers have tried to get around galling by opening up the bore in the feed section, but, in doing so, have they impaired the solids conveying ability, due to the radial step that now exists at the entry to zone one? Ever experienced poor feeding in your extruder? Axial grooves are fine, but radial steps or radial grooves in the feed section are a no no.

The only way to maintain accurate alignment of the barrel and feed throat is to manufacture them as an integral unit; essentially a long barrel with the feed throat port machined straight in.

What are the benefits of an integral barrel/feed throat design?

— no misalignment issues
— hard bimetallic liner in the feed sections comes for free
— long life before ware or galling
— no worries about radial steps impeding solids conveying
— 2/3 the total cost of a separate feed throat and barrel
— grooved feed designs can be optimized by extending them to any length with in the feed section and zone one.

The downside? There aren't really very many major down sides: you have to get used to the idea of swapping out a whole barrel when you want to change feed throat geometries or replace a damaged feed throat. The other problem is that some heat transfers into the feed throat zone.

- Mark Carter

See also:

- Alternatives for extruder barrel construction
- Extruder alignment
- Feed throat design
- Further comments on barrel profiles

- Misalignment

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