



An Introduction to the Posi-Melt Injection Screw.

- The requirements for a new screw design.
- The 'Standard' Posi-Melt Screw
- Posi-Melt EX Mixing Screw.
- Posi-Melt Barrier Screw

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The challenges of modern moulding

- Frequent material changes, even changing from semi-crystalline PA to amorphous PC in the same shift.
- Adding colour at the press.
- Complicated part geometry.
- Ultra-precise tolerances.



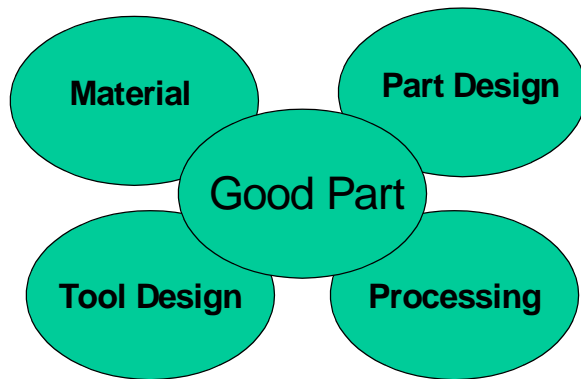
In this environment it is essential to optimize the moulding process.

What makes a good part ?

The goal of every moulder is to make perfect parts:

This involves a number of elements:

What makes a good part?



Equipment such as dryers, mould temperature controllers, chillers, moulding machines etc.

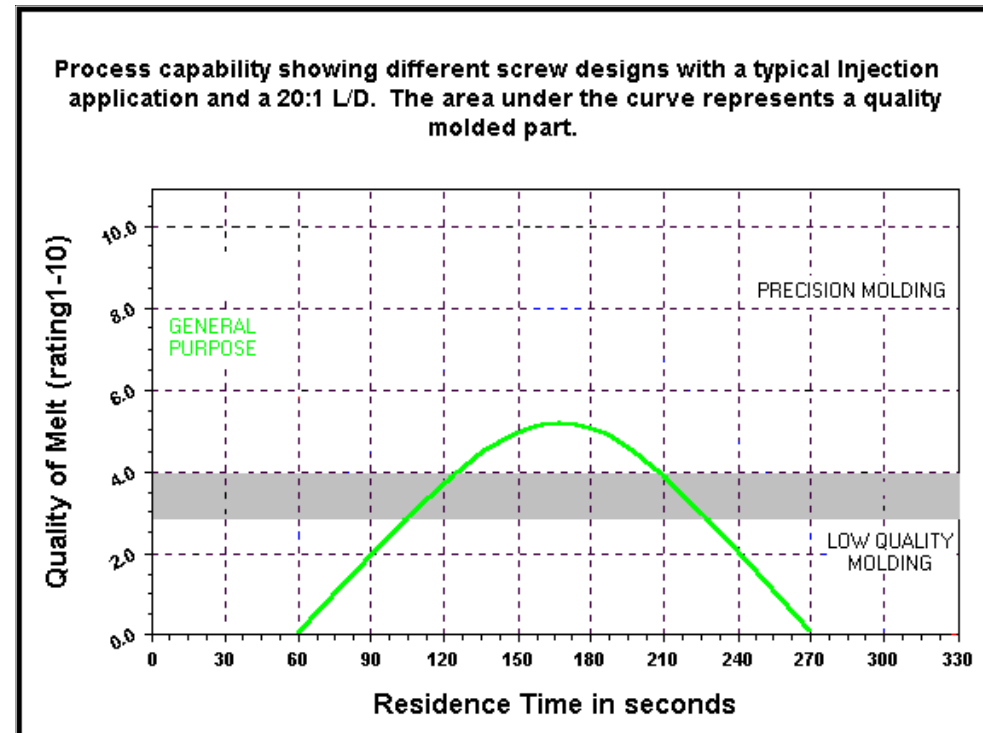
Melt Preparation Technology including screw design, screw tip assemblies, nozzles & tips, and the metallurgy for these components.

Moulding Strategy: e.g. temperatures, screw speeds, back pressure, injection velocities, time etc...moving from art to science.

The concept of a 'processing window'

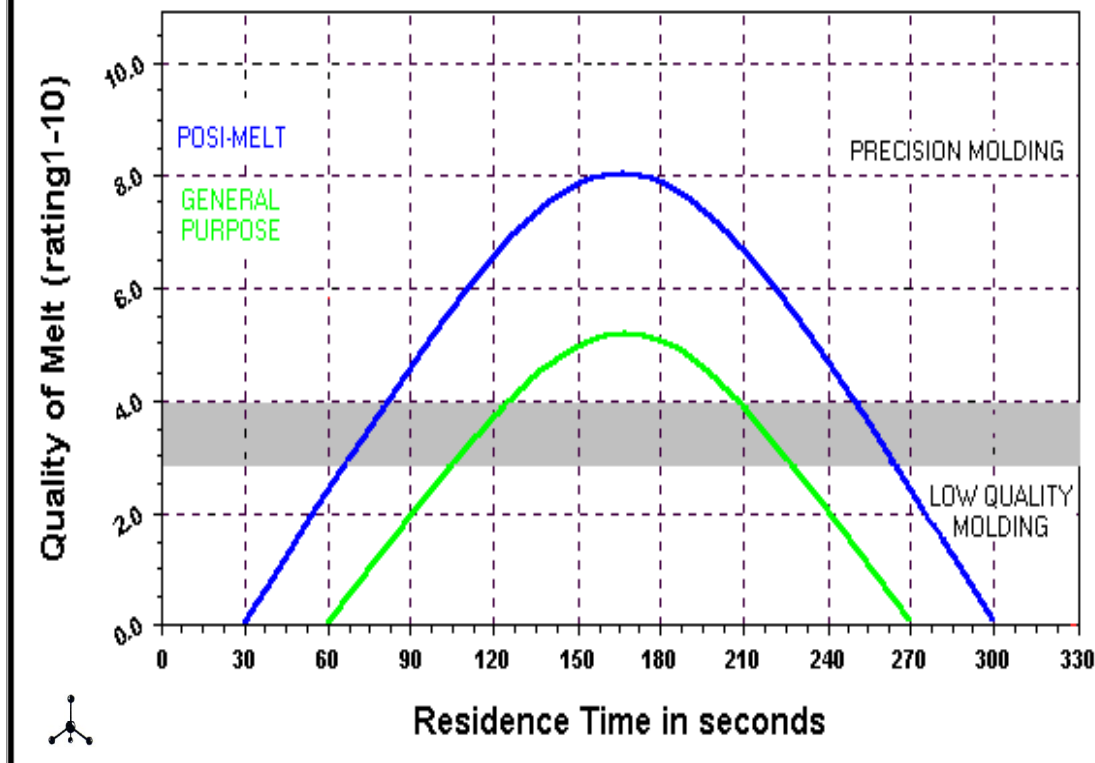
A typical moulding process has a limited 'processing window' where good parts are produced. This is represented by the area above the grey area below.

- The 60 year old technology of the 'GP' or General Purpose screw has a very limited processing window.
- Processing problems are often a direct result of a poorly prepared melt and a process operating outside this window.



Increasing the Process Window

Process capability showing different screw designs with a typical Injection application and a 20:1 L/D. The area under the curve represents a quality molded part.



Our goal is to widen the Processing Window by offering more advanced screw and screw tip designs.

This enables the moulder to produce parts of higher quality with lower rejects and with decreased cycle times.

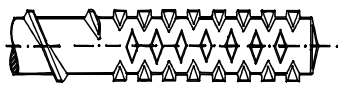
And all this with a screw which will also process a wide range of resins.

An overview of existing Screw Technology:



Mixing screw technology

Pineapple Mixing Section



Pulsar Mixing Section



BAD FEATURES:

- Expensive to manufacture.
- Mixer is very resin specific and unable to process a wide range of materials.

GOOD FEATURES:

- Superior Melting and Homogenous Mixing possible.

- Barrier screw technology:



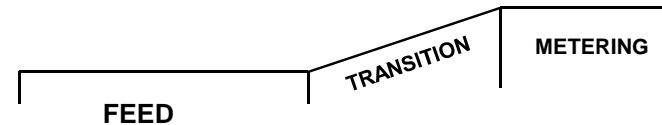
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GP screw technology:



BAD FEATURES:

- Various compression ratios and channel lengths, no Industry Standard.
- Poor melting performance.
- Poor mixing performance

GOOD FEATURES:

- Inexpensive to manufacture.
- Ability to process a wide range of materials.

The New Technology

The Posi-Melt Screw:



The Multi Purpose Posi-Melt Screw



The Posi-Melt Screw – a true Multi Purpose Screw.

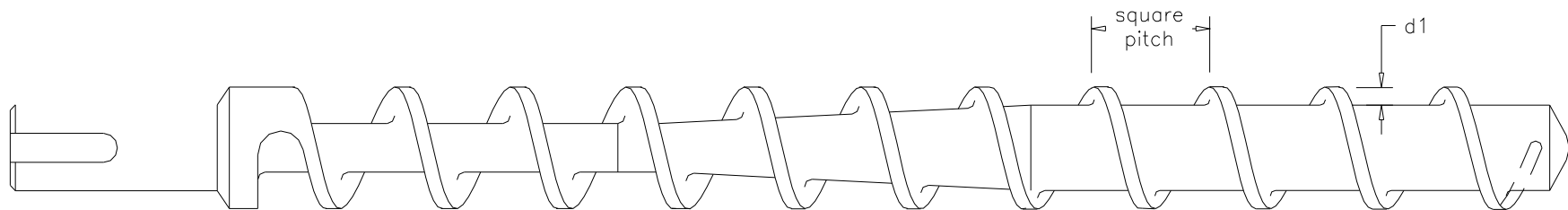
- The Revolutionary Posi-Melt screw design involves a change in the core geometry of a compression screw.
- By separating the root and the flight pitch into two coordinate systems, we are able to improve the melt quality by a factor of 3.8-4.5 compared to a GP design.
- The improved melt quality means an increase in productivity and more profits! Guaranteed...



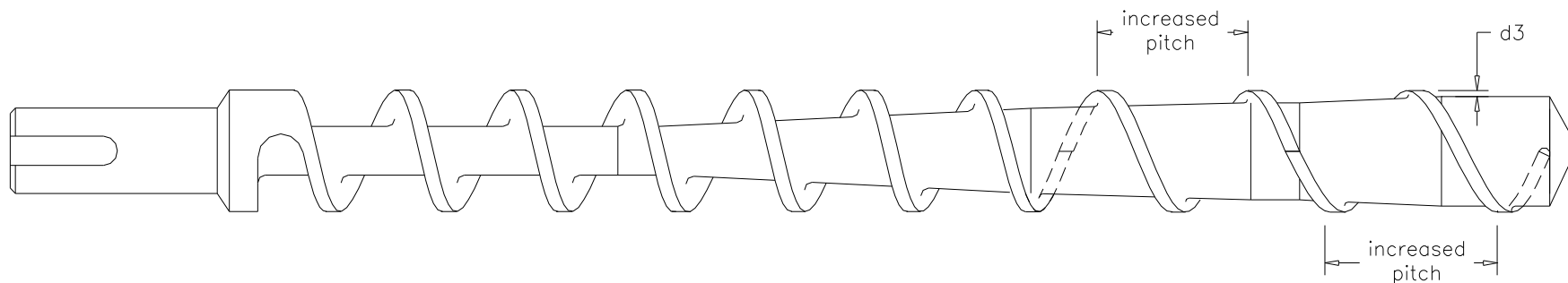
Standard GP screw vs. Posi-Melt Screw



Essential differences between a 'GP' screw and the Posi-Melt Screw

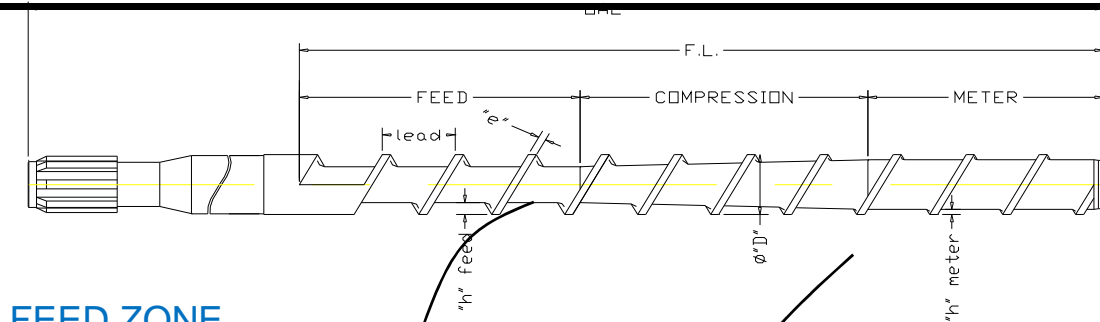


The GP Screw does not mix or melt the plastic thoroughly

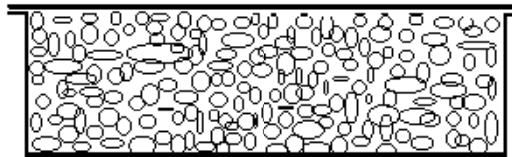


Through a series of flight pitch and root changes, the Posi-Melt Screw delivers a more thoroughly melted and mixed melt pool.

The Melting Process: GP Screw



FEED ZONE



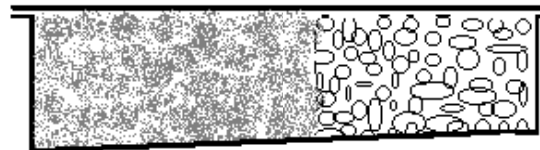
Solids are conveyed in this feed section, variables are; flight depth, pellet size, shape, coefficient of friction of the resin, temperature, surface finish.

METERING ZONE



Solids bed breakup occurs here. It is hard to conduct heat through the molten plastic to the remaining un-melts. Until melting takes place, homogenization cannot occur thereby delivering poor melt quality.

COMPRESSION ZONE

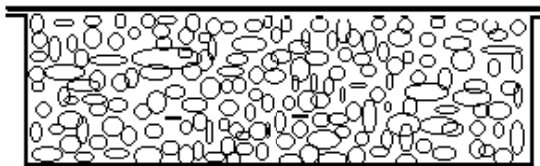


Melting progresses, the plastic pellets pick up heat from the barrel wall and form a melt film, the melt film is wiped from the wall to form a melt pool. There is a distinct solids bed and melt pool formation.

The Melting Process: Posi-Melt Screw

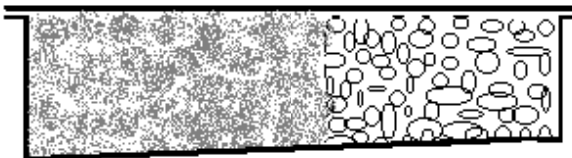


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METERING ZONE II



The shallow channel depth which leads to 50% more exposure to the barrel wall, change in velocity, change in pressure and re-orientation that occurs as a result of the Posi-Melt™ technology, assures a more thoroughly melted and homogenous melt pool.

The Standard Posi-Melt Screw: Features



1. Multiple lead changes create a change in velocity.
2. “Stepped” lead vs. root creates a change in pressure.
3. A change in pressure and velocity creates a high level of homogenization.
4. An increased pitch (helix angle) ensures a 50% increase in plastic exposure to the barrel wall. The shallow metering section delivers better conductive heat transfer for better melting.
5. The throughput is dictated by the depth at the taper terminus, but the design is essentially a low compression design with high linear depth ratios.
6. The cost to manufacture is little more than the industry standard GP screw.

Benefits of the Posi-Melt Screw.



- Increased throughputs of between 10-30% giving faster screw **recovery times**.
- Increased throughput enables a lower rpm for reduced heat generation and **cooler melt temperatures**. Cooler melt temperatures = decreased cooling time and **lower cycle times**.
- Zero temperature overrides for complete **control** of your process.
- Better **mixing** capability = the ability to lower back pressure for cooler melt temperatures and **less screw decompression**.
- Versatility to process **all** resin groups.

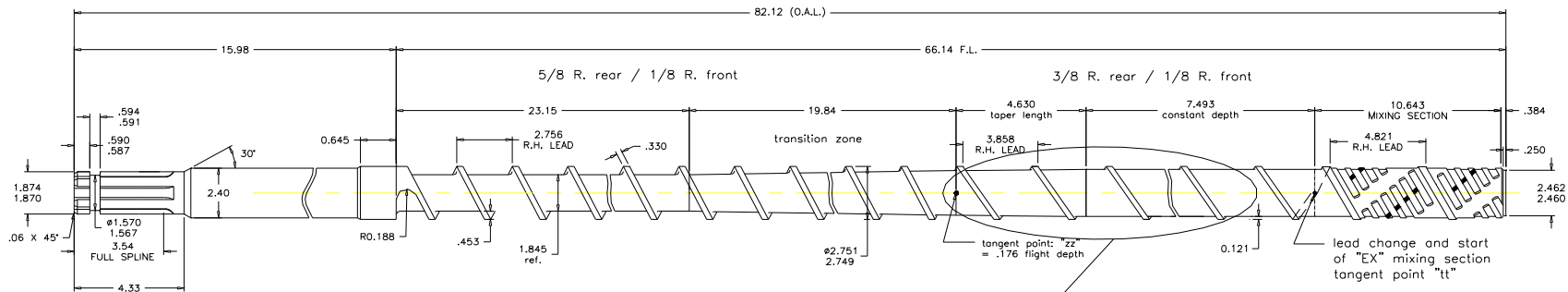


The Posi-Melt EX Screw .

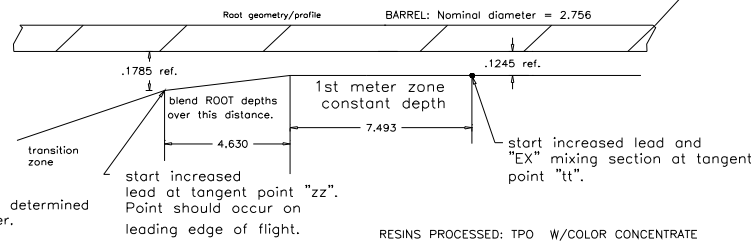
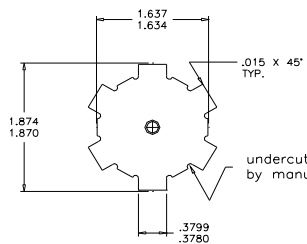


- Distributive and Dispersive action gives improved colour mixing
- Increased throughputs mean faster screw recovery times.
- Consistent screw recovery with low deviation gives better cycle times
- Low compression ratio extends screw wear life
- Superior melt quality yields higher productivity.
- Available to suit any machine type or size.

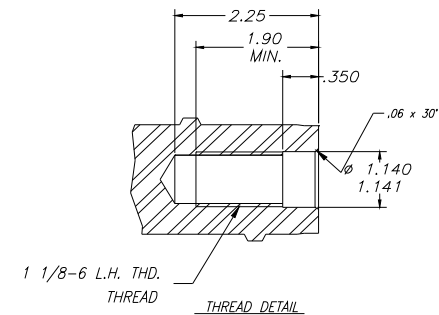
Posi-Melt EX Screw – Typical Design Data



*See dwg. SNA2.756-24EX2462A for mixer detail.

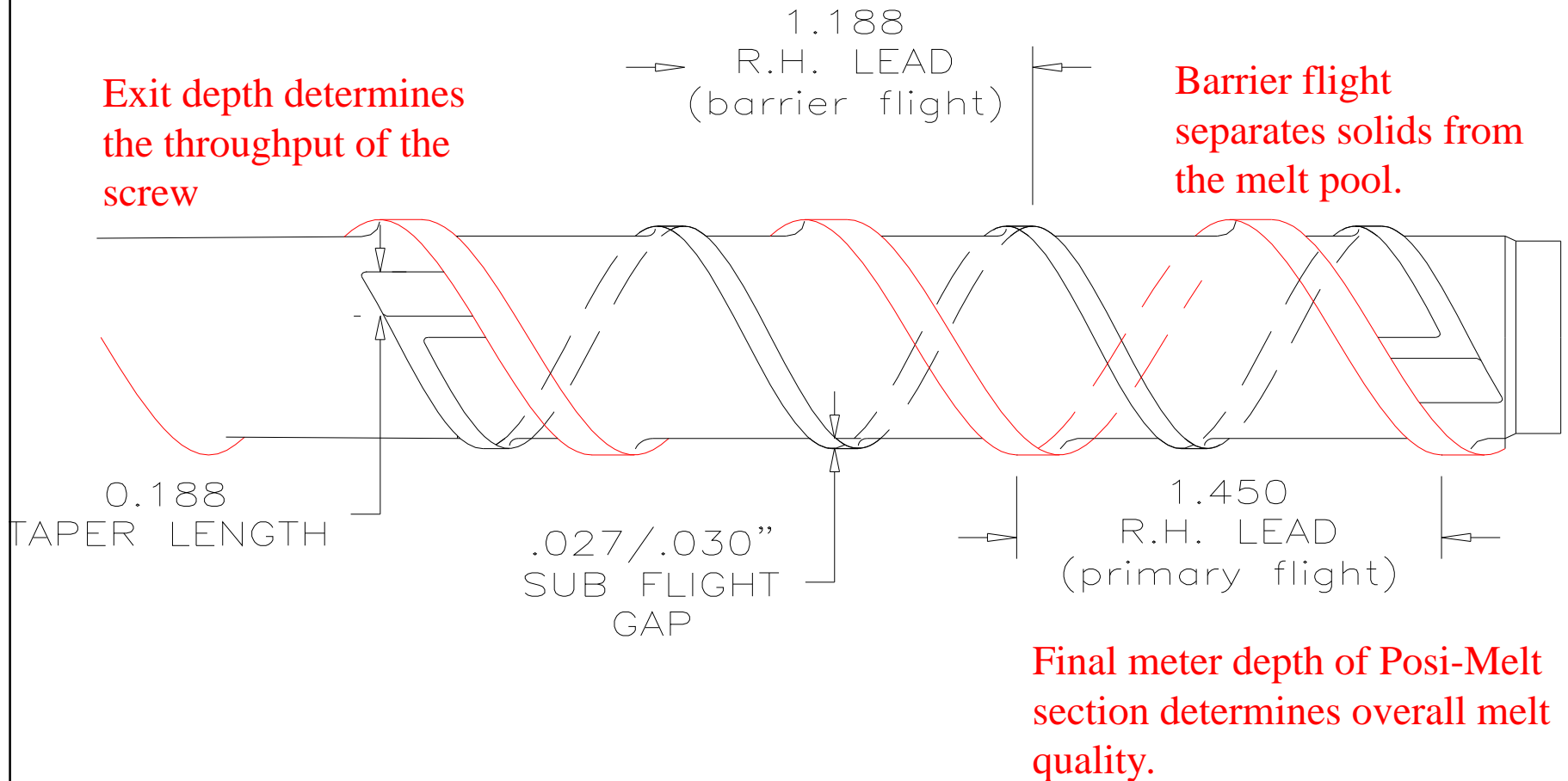


RESINS PROCESSED: TPO W/COLOR CONCENTRATE

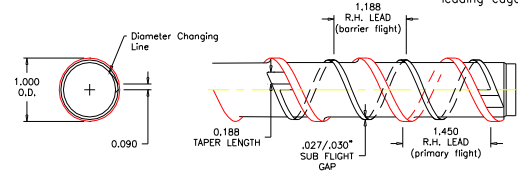
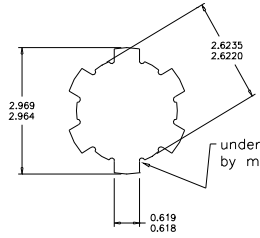
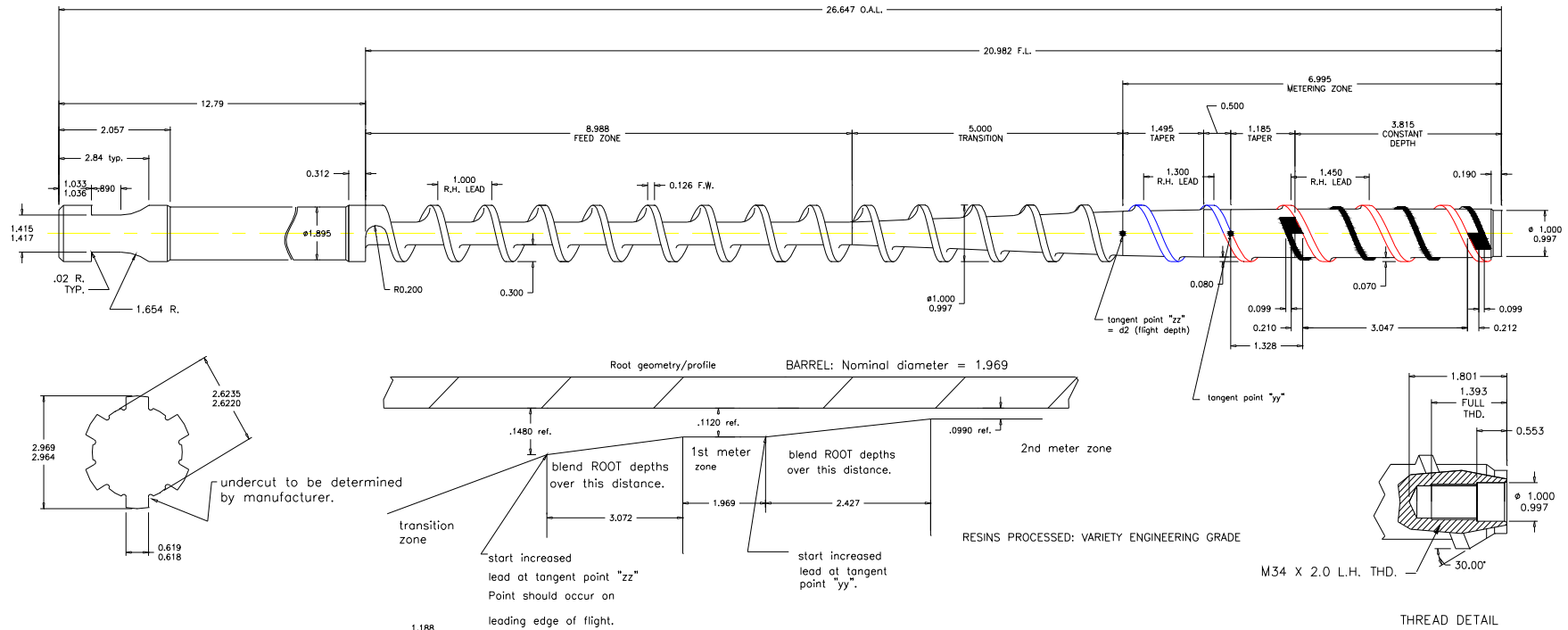


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Posi-Melt Barrier Screw –High Throughput



Posi-Melt Barrier Screw – Typical Design



MATERIAL CONSTRUCTION: CPM-9V TOOL STEEL, HT RC56-58, POLISH ROOT

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Conclusions



- The Plasticating screw and screw tip assembly are the heart of a moulding machine.
- Single flighted GP compression screws are outdated technology.
- Custom and Trade Moulders both greatly benefit by using the Posi-Melt™ Technology.
- To increase productivity and stay ahead of the competition it is important to use modern designs of injection screws and screw tip assemblies.
- Call us for more details !

Contact Details



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