Advantages of Quality Paratubes in Medical Applications

What Are Paratubes?

Paratubes are two single-lumen tubes that are bonded longitudinally during extrusion. Typically used for fluid conveyance, paratubes are manufactured in varying durometers for a range of applications. Their uses extend far beyond just fluid conveyance, however. Applications range from respiratory therapy, blood transfer technologies, and endoscopic applications.

Teel Paratubes

Paratube Advantages in Medical Applications

There are many reasons why a device manufacturer might choose to design their device with paratubes. The bonded tubes are easier to position and handle during medical equipment assembly and can improve handling and identification in more direct patient care applications. They can also prevent the need to use clips or ties to organize multiple tubes, prevent tangling, and increase patient comfort by reducing the number of separate tubes to be handled during a procedure or hospitalization.

Paratube Options

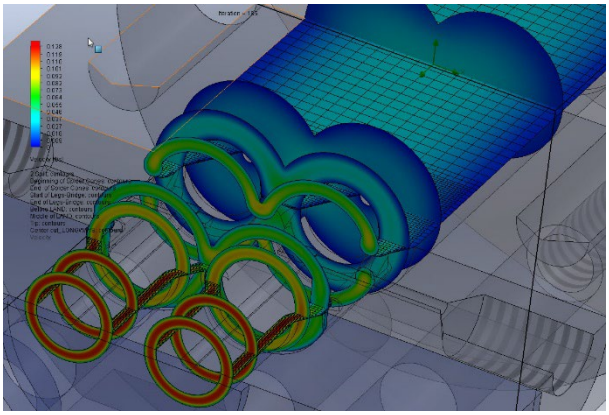
Teel offers paratubes in a variety of materials and dimensions, including flex PVC and PVC alternates, as well as engineered materials like copolyester elastomers. Size ranges are from 0.050” up to 1” per tube, depending on material. Paratube sets can also be made in three- or four-tube configurations and with tubes of different diameters.

Depending on end device design, tubes can be made with a targeted level of peel strength, or adhesion, and frost. Higher peel strength is beneficial when tubes are meant to remain together throughout the life of the product. Lower peel strength allows tubes to be separated with a controlled force when needed for device assembly or as part of an end-use operation. Controlling peel strength is critical to prevent damage to the separation surface (zippering) leading to device rejection or premature separation. This can cause device assembly issues through equipment jams or high scrap levels.

Frost levels are typically used to prevent adhesion between tubing sets or to prevent layers of tubes sticking on a spool. Frost can benefit automated assembly operations if this is an issue. Frost can also be applied as an aesthetic choice without a clearly defined benefit to device function. It can be applied uniformly across a tube or in segmented lines or stripes down the length of a tube. Frost control is achieved through tooling design and other process controls but is limited by tubing size and material choice. Not all materials are compatible with all frost levels.

Controlling for Paratube Quality and Consistency

Teel's custom paratube extrusion process controls for the key aspects of paratube performance: tube dimensions and the force required to pull the two tubes apart (peel strength). A consistent peel strength and precise dimensions, including center alignment and OD/ID ratio, are critical, especially if the paratubes will be machine processed during automated product assembly.



An image from Teel's paratube melt flow analysis modeling a paratube extrusion die.

While many manufacturers use two separate extruders to produce each tube, Teel uses melt flow analysis to create a single die design for our paratubes, which helps to maintain reliable quality during extrusion. Using the same die and one extruder to produce both tubes helps control dimensional consistency by keeping the melt temperature the same for each tube. The uniform temperature is also important for creating consistent adhesion at the paratube marriage point. As the tubes leave the single die head, they are also stretched at the same rate, maintaining a consistent drawdown for further dimensional uniformity.

Conclusion

For a range of applications, paratubes offer advantages for their ease of use and suitability for dual tube medical device designs. If you're exploring tubing designs for your product and are interested in paratubes, reach out to our medical device team. We can partner with you from development to production.