



The more you know...

Stevens Urethane Plays Major Role In Open-Heart surgery

Keeping the heart muscle cool and protected is a crucial element of successful open-heart surgery. The Topical Cooling Device (TCD™) manufactured by Ethox Corp. for COBE Cardiovascular, Inc., offers convenient, effective protection to the heart without the drawback of chilling the surgeon's fingers, which could interfere with the sense of touch necessary to perform the delicate surgery.



Urethane's flexibility, thermal properties, strength and ease of fabrication made it the material of choice over other plastics such as PVC. Stevens Urethane from JPS Elastomerics provides the qualities needed to make the TCD a successful heart cooling device.

ice slush, which was messy and tended to chill both surrounding organs and the surgeon's hands.

The Winning Combination For Urethane

The TCD is a flexible foam insulated urethane pad that is wrapped around the heart throughout the surgical procedure. A saline solution cooled to 10°C to 15°C (50°F to 59°F) flows in a closed loop through the thin flexible pad to cool the heart muscle. Traditional methods included

Low Temperature Flexibility

Since the TCD comes in direct contact with the heart muscle, softness and flexibility at low temperatures are of utmost importance when specifying the material. PVC was originally considered, but it becomes rigid at low temperatures, with the potential to tear or damage the heart. Urethane, on the other hand, remains soft and pliable even at very cold temperatures, offering reliable protection.

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Why Stevens Urethane from JPS Elastomerics was chosen

PRODUCT	LOW TEMP FLEX	TEAR STRENGTH #/IN (GRAVES)	ABRASION RESISTANCE	PURITY	THERMAL PROPERTIES
PVC	Good	100-400	Fair	Poor	Poor
URETHANE	Good - Excellent	400-800	Excellent	Excellent	Excellent

Thermal Properties

In addition to its low temperature flexibility, Stevens Urethane is highly efficient in terms of cooling, and quickly goes from warm to cold and vice versa. It is more efficient in terms of heat transfer and draws heat away from the heart faster than PVC. Urethane also maintains its structural integrity over a wide temperature range, and can be quickly cooled without crystallizing or freezing.

Purity

Open-heart surgery also demands the purest material possible. The TCD was made with

100% virgin polyurethane, which can be sterilized with ethylene oxide. TPU is also free of migrating plasticizers, which could weaken the structure or contaminate the surgical environment.

Strength

Material strength at the thinnest possible gauge was another criteria when choosing the proper material for the TCD. Only urethane had the required tensile and tear strength at thin gauges to keep the device both safe and slim. PVC, by comparison, would have required a thicker sheet, which would have further reduced its flexibility.

Ease of Fabrication

The manufacturer of the TCD, Ethox Corp., was also pleased with the fabrication versatility of Stevens Urethane. This allowed Ethox to use its existing radio frequency seal operation to join the TPU sheets together around the foam pad. In addition to RF sealing, TPU can be fabricated in many other ways, including heat lamination, adhesive bonding, sewing, and vacuum forming.

About TPUs

- Stevens Urethane is a thermoplastic polyurethane, or TPU. TPUs are versatile elastomers that combine the best properties of both rubber and plastic to offer a unique combination of high performance properties.
- Stevens Urethane offers exceptional strength and durability, so a thinner gauge of TPU can be used when compared to PVC and other materials.
- TPU offers excellent resistance to a wide range of chemicals, as well as moisture and fungus.
- TPU is non-irritating, and is ideal for applications requiring contact with human skin.
- Because it contains no plasticizers, TPU offers excellent low temperature performance. It also lasts longer whether stored or in use.
- TPU can be produced in a wide range of durometers, 75-95 Shore A, from a relatively stiff material to a soft material with a non-plastic feel.
- Stevens Urethane is available as sheet, film, tubing, cord and profile extrusions. A range of colors, opacities, and surface finishes suits any application's aesthetic requirements.
- Stevens Urethane is easy to work with and can be fabricated in many ways: die-cut, radio frequency sealed and thermally

Product Features of Stevens Urethane

	MP-1880	MP-1882	MP-1890
Tensile Properties (D638)			
Modulus @ 100% strain psi	1000	800	1500
Modulus @ 300% strain psi	2000	1100	3000
Modulus at break psi	7000	6000	8000
Modulus of elasticity up to 10% strain psi	35	25	50
Elongation @ break, %	450	550	400
Set @ break, %	35	40	25
Tear Properties			
Die C, D624, pli	400	375	500
Abrasion Resistance			
Mg. weight loss per 1000 cycles, 1000 gm. load, H18, C501, mg.	30	100	25
Maximum Service Temperatures			
Continuous, °F	-60 to 200	-65 to 175	-60 to 225
Durometer (D2240)			
	87A	82A	90A
Thermal Properties			
Melting point range, °F	350 to 390	290 to 330	380 to 420
Specific Gravity (D792)			
	1.12	1.14	1.14
Yield Factors			
Square feet/pound/mil thickness	171.8	168.8	168.8
Humid Aging Resistance			
90% relative humidity at 160°F / 70°C	Excellent	Excellent	Excellent

bonded, vacuum formed, heat laminated, and adhesive bonded to itself or other materials. It can also be printed or silk-screened.

- JPS Elastomerics' technical support includes chemists, quality control personnel, technical sales staff and production experts. These people are ready to work with you to find the best solution to your design challenge.

STEVENS
Urethane
Film & Sheet