

Polyfab Plastics and Supply

Surgical fluid collection unit benefits from proprietary thermoplastic alloy

KYDEX® Sheet Protects Against Contamination

SPRINGFIELD, MO — The safe collection and disposal of bodily fluids post surgery is a critical procedure. Fluids must be stored in secure containers and disposed of in a manner that precludes exposure of personnel to contamination. The procedure can be expensive, however, with hospitals paying hefty fees for specialized disposable containers, treatment chemicals, and hazardous-waste pickup and disposal.

To improve the safety and economics of bodily fluid disposal, a medical supply company has developed two portable collection units, the High Fluid Cart and the Safety Station.

The High Fluid Cart, 990mm H x 940mm W x 584mm D (39" x 37" x 23"), is for use in the operating room. Up to 48 liters (13 gallons) of bodily fluids are pumped into its two reusable polyethylene canisters during surgery. After surgery, fluids are drained into a hospital's waste-disposal system through valves in the bottom of the canisters, which are then transferred to a tub in the Safety Station. The Safety Station, measuring 1067mm H x 1067mm W x 762mm D (42" x 42" x 30"), utilizes an automated system housed in a lower compartment to clean and sterilize the canisters for reuse. The procedure is quick, safe and can reduce waste-disposal costs.

The High Fluid Cart has a two-piece lid to guard against spillage during use. The outer portion of the lid is pressure-formed and adhesive-bonded to a vacuum-formed inner lid, then sealed with a gasket. The Safety Station is designed with a vacuum-formed tub that holds the two canisters during cleaning and sterilization. Fabrication of the lid assembly and tub is by Polyfab Plastics & Supply, a thermoformer in Springfield, MO. For thermoforming of the parts, the company uses a proprietary thermoplastic alloy called KYDEX® T thermoplastic sheet, produced by KYDEX, LLC, Bloomsburg, PA. Polyfab ships the tub and lid to its customer who assembles them within a metal housing.

Don Stiger, head of engineering at Polyfab says, "The KYDEX® T alloy offers the physical properties, chemical resistance and formability needed to meet the requirements of the unit."

He cites the vacuum-formed tub as the biggest process challenge because it requires a 660mm (26") deep draw that caused the wall of 9.60mm (0.375")-gauge flame-retardant ABS sheet originally specified, to thin out to 1.27mm (0.050") after vacuum-forming—60 percent thinner than the required minimum of 3.20mm (0.125"). "It is critical for the deepest portion of the tub where a flange is inserted for drainage to remain structurally sound," he says.

"The ABS sheet was also susceptible to damage during routine processing and handling," he continued, "occasionally scuffing and scratching the ABS substrate and its coloured cap film."

"The ABS worked relatively well in prototyping, but we had difficulty in production because the tools had changed," Stiger recalls. "We were having problems maintaining wall thickness in the tub, and could do nothing to overcome the scratching."



High Fluid Cart uses a two-piece lid fabricated of KYDEX® T thermoplastic alloy sheet to guard against spillage during operating-room use. Outer portion of the lid is pressure-formed and adhesive-bonded to a vacuum-formed inner lid, then sealed with a gasket.



Safety Station incorporates a deep-draw vacuum-formed tub that maintains even wall thickness through use of KYDEX® T thermoplastic alloy sheet.

KYDEX, LLC
ISO 9001 and 14001 Certified

Customer Service
6685 Low St, Bloomsburg, PA 17815 USA
Phone: 800.325.3133, +1.570.389.5810
Outside the US: +1.570.389.5814
Fax: 800.452.0155, +1.570.387.7786
Email: info@kydex.com

Technical Service
Phone: 800.682.8758 ext. 581
Fax: +1.570.387.8722
Outside the US: +1.570.387.6997 ext. 581

www.kydex.com

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Stiger had worked with KYDEX® sheet on previous projects and decided on a "KYDEX® T" grade in 9.60mm (0.375") thickness. "We altered the tool and the blank sizes, pulled a couple of parts, and verified that the wall thickness of the KYDEX® sheet around the flange was 3.18mm (0.125"), which was acceptable to the customer."

According to the manufacturer, KYDEX® T thermoplastic sheet exhibits greater impact strength, scratch resistance and extensibility than flame retardant ABS, is less hygroscopic, and carries a fire rating of UL Std. 94 V-0/5V. It is also said to be more chemical resistant, and therefore unaffected by bodily fluids or the repeated cleanings and sterilization that the Safety Station undergoes.

Polyfab, which supplies components for more than 75 of the fluid collection units per year, specifies KYDEX® T sheet for the project in a custom light grey colour with smooth matte finish. "We have no problems getting custom colour with the volume we order," says Stiger, "and the ability of the sheet to meet some demanding requirements is a big reason the project is successful."

Parts are produced on a three-station rotary machine from Maac Thermoforming, Carol Stream, Ill. After fabrication, Polyfab trims the parts with CNC routers. The company then bonds component mounting points, fashioned from strips of KYDEX® T sheet, to the underside of the parts with adhesive.

Polyfab Plastics and Supply

820 N. Cedarbrook
Springfield, MO 65802 USA
417-862-6512
customerservice@polyfabplastics.com
<http://www.polyfabplastics.com>

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ISO 9001 and 14001 Certified

Customer Service

6685 Low St, Bloomsburg, PA 17815 USA
Phone: 800.325.3133, +1.570.389.5810
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