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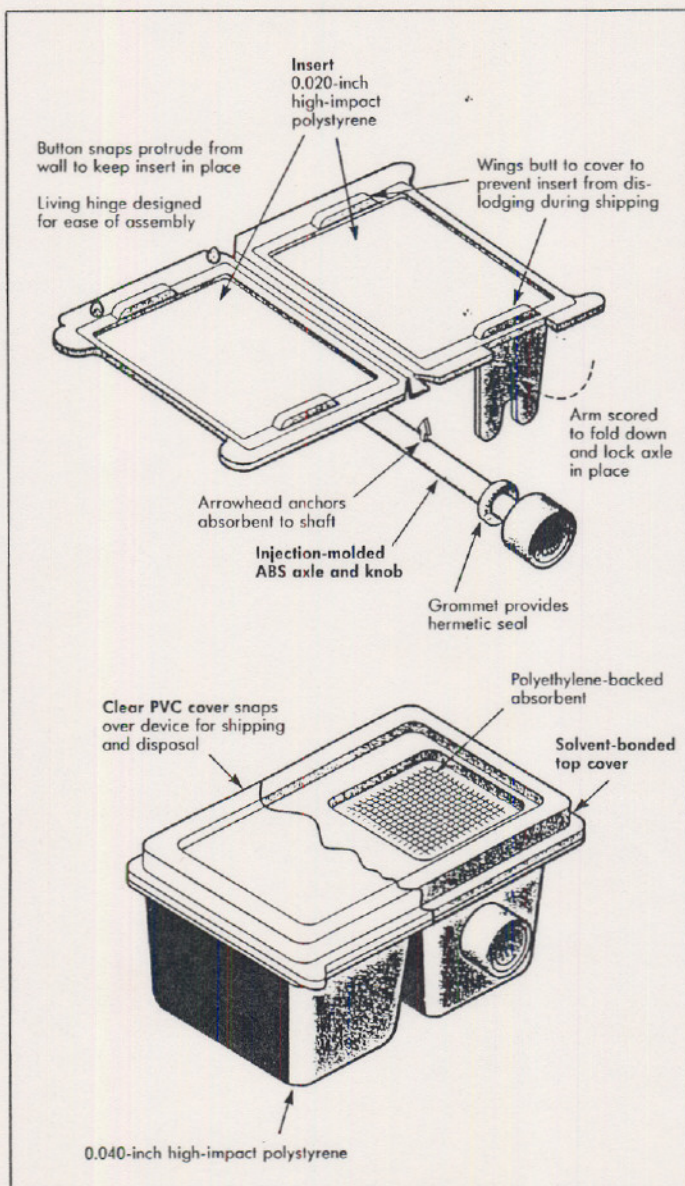
Designing with Plastics

Using Plastic to Add Value, Not Cost

Concept: Concord Portex (Keene, NH), a supplier of disposable medical products, conceived a new product that would isolate and contain waste blood during laboratory testing. During typical blood-gas analysis, technicians must expell small amounts of blood from a syringe into 2 x 2-in. gauze pads to remove contaminated or clotted blood before testing. The new product, called HemoSafe, would be designed to reduce the hazards of this exposed blood by enclosing a roll of gauze in a self-contained, sealed unit. The technician would deposit the waste blood into a pad through a 2 x 2-in. window, then turn a roller to expose fresh gauze. The unit could be sealed for disposal.

Design Challenge: To successfully compete against an established, inexpensive commodity like gauze squares, the new product would have to provide added value without substantially increasing the per-use cost. It would thus have to be efficiently designed and manufactured. At the same time, however, it had to compare favorably with gauze pads in terms of weight, size, and ease of use, while attaining its primary objective of safely isolating potentially hazardous waste blood.

Methods and Materials: Thermoformed polystyrene appeared to be the logical choice of material and forming method, because of the light weight and low cost of the material and the substantial savings in tooling costs compared with injection molding. Several challenges remained, however. The product had to be strong enough to withstand rough handling during shipping, so a substantial wall thickness was essential. This requirement would be difficult to satisfy by thermoforming, since the process is typically limited to a depth-to-width ratio of about 1:1, whereas the product was to be more than 30% deeper than it was wide (2 7/8 x 2 in.). The relatively complex design also had to be easy to assemble by hand labor. In addition to these requirements, Concord Portex expected to make design



Despite a complex design, the HemoSafe assembles easily.

changes based on on-site testing, and hoped to be able to make them quickly and inexpensively.

Concord's thermoformer of choice, Crystal Thermoplastics (Cumberland, RI), used aluminum female tooling with a matched plug-assist made of epoxy to deep-draw the shell from polystyrene 0.040 in. thick. This method allowed Crystal to provide sufficient thickness and strength in the walls of the shell. Crystal's in-house design department also helped Concord engineers simplify the design, incorporating several diverse functions into a single, critical component—the 0.020-in. polystyrene insert. This insert acts as a guide for the gauze roller, as a hold-down for the take-up roller, and as a strengthener to the side walls during shipping.

Field testing resulted in several more changes, including down-sizing the unit, backing the gauze roll with polyethylene to encapsulate waste blood, and adding adhesive strips for tabletop mounting.

Results: Among the benefits to Concord of Crystal's thermoforming process were:

- Reduced tooling costs of \$4000 compared with an estimated \$80,000 for injection molding
- Reduced turnaround time for prototype molding
- Easy solvent bonding of the polystyrene top to the shell
- Elimination of all fasteners—except for the solvent-bonded top, all assembly is snap-fit.

Total time from conception to finished product was approximately 10 months. The HemoSafe effectively isolates biohazardous waste, reduces housekeeping requirements, and creates a safer workplace for lab technicians. It costs about the same as the gauze pads it replaces, weighs about the same, and occupies no more space than the equivalent number of waste pads.

For more information on Crystal Thermoplastics, circle Reader Service Number 12, or call 401/333-6363.