

Product Focus: Clean Room Furnishings

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Choice of clean room casework, or furniture, is one of the most important decisions made when setting up classified space. Cabinets and associated doors, hinges, handles, panels, benchtops, shelving, and vertical/horizontal surfaces must be compatible with the application and the clean room's classification by Federal Standard 209E for airborne particulate cleanliness. Surfaces must be as easily cleaned as walls and floors, emit no particulate contaminants, and above all resist exposure to liquids and solids processed inside the room. Since the purpose of a clean room is to protect the environment from hazardous materials or sensitive materials from the environment and humans, or both, clean room casework must fulfill those missions and be environmentally "invisible."

Facilities—walls, ceilings, lighting fixtures, and furniture—are a significant source of clean room contamination arising from the materials of construction or, secondarily, from surfaces that harbor contaminants from other sources. For example, crevices that collect dust and are difficult to clean may be suitable for casework installed in non classified rooms, but not for even a Class 10,000 clean room where cabinets and drawers should be at least as inert and cleanable as the clean room walls and floors.

Material choices

Most clean room casework today is made from coated steel, stainless steel, and polypropylene. Polypropylene used in casework fabrication comes in four grades: standard and three flame retardant grades that Terry Thompson, polypropylene sales manager at [NuAire](#) (Plymouth, MN) likens to "a Chevy, a Cadillac, and a Ferrari." The lowest grade will minimize fire damage while the highest grade, FM-4910, will self-extinguish if it catches fire.

Polypropylene casework has been around for years, remaining a niche product due to its high cost, but Thompson says polypropylene is the material of choice for clean rooms that use corrosive acids or chemicals or that experience high humidity.

Polypropylene is about 2.5 times as expensive as steel or wood casework and just slightly more expensive than stainless steel. As Thompson explains, "Polypropylene is made from a petroleum product, so we're at the mercy of the oil markets. But more important, a polypropylene cabinet needs a lot of handling during manufacture—much more than stainless steel, which is simply put onto a machine and bent, formed, punched, and welded. Polypropylene edges are sharp and must be smoothed and de-burred, then welded together."

Approximately 80 percent of Nu- Aire's poly casework installations are for the semiconductor industry, with modest representation by pharmaceuticals and biology. And these are all-plastic: doors, panels, horizontal surfaces, drawers, even hinges, latches, screws, and fasteners. "You don't want something rusting in a clean room and contaminating your specimens or processes," Thompson says.

One would expect the pharmaceutical industry, with its penchant for cleanliness and disregard for high-priced equipment, to embrace polypropylene casework. Thompson believes the reason they have not is because drug makers are used to stainless casework and work surfaces. Another possible reason, notes David Campbell, VP of sales at [HEMCO](#) (Independence, MO), is that most pharmaceutical clean rooms are used for aseptic processes such as formulation and vial- or syringe-filling rather than for handling corrosive materials used in processing or manufacturing. The perception, he says, is that cleaning validation for stainless steel is more straightforward than for other materials. "In pharmaceuticals the sun rises and sets with stainless steel."

Companies considering all-polypropylene casework might save considerable expense by rethinking how and where the clean room workflow will occur. Campbell notes that applications requiring corrosive materials will often take place within a fume hood, which makes the acid-sensitivity claim for polypropylene moot outside that work area. "There is no reason why owners cannot specify a polypropylene or poly-resin material for fume hoods only, and less expensive casework materials for the rest of the room."

Specifications

Clean room casework is normally specified by whoever plans the room, which is either an architect or a company engineer. Owners increasingly ask for modular casework, Thompson explains, because it provides versatility and changeover capability when a clean room's mission changes.

Outside design firms sometimes over specify for casework, Thompson says, to cover all contingencies. In one instance where polypropylene casework was designated, Thompson called the owner to confirm that the application called for it. "They didn't realize how expensive it was and wound up ordering a less costly alternative that suited their needs just as capably. If you can get by with metal casework, that's obviously the way to go."

Hemco specializes in Class 1000 and Class 10,000 clean room furnishings and installations, a niche that Campbell describes as "clean labs" to distinguish them from higher-class semiconductor processing suites. Hemco has done Class 100 installations, but usually as sub-areas of Class 1000 rooms. Within that marketplace the company sells casework fashioned from welded steel coated

with an epoxy powder coat finish. These structures are fabricated as easily as stainless steel but have much higher resistance to acids and moisture. They are also available for about one-third the cost of polypropylene and stainless.

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