

A Flexible Cleanroom Environment Provides Solid Contamination Protection

The liquid crystal display (LCD) rear-projection televisions and plasma-based direct view televisions assembled at the Sony Technology Center-Pittsburgh (STC-P) in Mt. Pleasant, Pa. — about 35 miles east of Pittsburgh — contain many precise components. Along with rendering a clear, finely detailed picture, the technology can amplify the slightest spec of dirt if it finds its way into the micro-display assembly.

The standard approach most companies take to eliminate such problems is to erect solid-wall cleanrooms. Tightly sealed from floor to ceiling, these enclosures defend against the invasion of debris for manufacturing, quality control and product development.

Sony chose a more innovative approach to dirt management — Goff's Curtain Walls. It elected to *control* dirt and dust in a key manufacturing area rather than try to *eliminate* it, which would have been, at best, difficult.

Scott Olsen, the manager of production support at STC-P, is responsible for facility and equipment maintenance along the LCD production lines. "Our ability to keep dirt, dust and debris out of the sets and off the optics is crucial to the production process for our products," he says.

Sony installed the Curtain Walls to match the conditions of a class-10,000 cleanroom. "We had been purchasing cleanrooms for substantial amounts of money, and we rarely found the results to be adequate," Olsen reports.

About a year ago, Olsen came across information on the Curtain Walls. Though these vinyl curtains don't offer the extremely tightly sealed environment offered by solid walls, he reasoned that strategic use of air currents could do the job they needed in their plasma assembly area.

"If quality control spots any dirt on the set," Olsen said, "we have to completely disassemble the set. This is much more time consuming for our LCD and plasma production lines."

The new approach worked out and the curtain walls enclose a complex of rooms within the assembly area. In the plasma television assembly area, Sony put up two 100-ft.-long walls in two locations to produce zones within the overall room. An 80-ft. x 120-ft. area encloses the LCD television projection area, and has a changing area attached to it via a Curtain Wall passage way.

The Curtain Walls withstand tough industrial environments. The upper and lower opaque PVC sections weigh 14 oz. per sq. yd. The fabric is reinforced with polyester 9 x 9 x 1,000 denier weft inserted scrim, laminated into the fabric to give the Curtain Wall a high tear and tensile strength without sacrificing flexibility. These reinforced vinyl curtain materials are exclusively manufactured for Goffs to be certified flame retardant by the California State Fire Marshal's office, as well as passing the NFPA-701 test for fire resistance.

The polyvinyl Curtain Wall material is water-repellent, mildew- and rot-resistant as well as being able to withstand most chemicals. It can withstand a maximum temperature of 180°F and contains a cold crack resistance to -40° F.

The upper and lower reinforced vinyl Curtain Wall sections are double lock-stitched to a 20-mil thick, 52-in.high windowed section that withstands temperatures of between -20°F and +150°F.

Brass, toothed grommets along the top of the curtain attach it to dual-wheeled roller hooks. Should workers want to open the curtain, the wheels glide easily on the galvanized steel track system. Goff's Curtain Walls easily attach to one another via hook and loop fasteners on each outer vertical edge and a zinc plated chain is sewn into the bottom edge for additional weight.

Sony's Olsen points out that "unlike the construction of a solid-wall cleanroom, we used our own labor to hang the curtain walls."

The strategy is dirt- and dust-management rather than elimination. The curtain has a valance hanging from the ceiling, with the enclosed section being pressurized. "Actually," says Scott, "the dirt and dust are pushed out of the contained area along the floor."

About 50 people work in the large assembly area, which also houses a conveyor system. To reduce the contamination, a battery of forced fan units (FFUs) are used, each fitted with HEPA filters to force the air in a specific direction. The system continuously pushes air into the dirtier areas, which forces the debris out.

The amount of fan power needed to be fine-tuned. At first Sony had the room overpressurized and the pass-throughs ballooned outward. Sony added vents into the walls to relieve the pressure. The ballooning illustrates the seal provided by the curtains. Curtain sections overlay and are connected using strips.

In all cleanrooms, entry is another important consideration for environmental control. Products and parts pass through a double-door interlock system using Goff's Power Roll roll-up doors. Controls ensure that when one of these motorized roll-up doors is open, the other is closed. When the inner door opens, the fan system pushes the dirt out of the room.

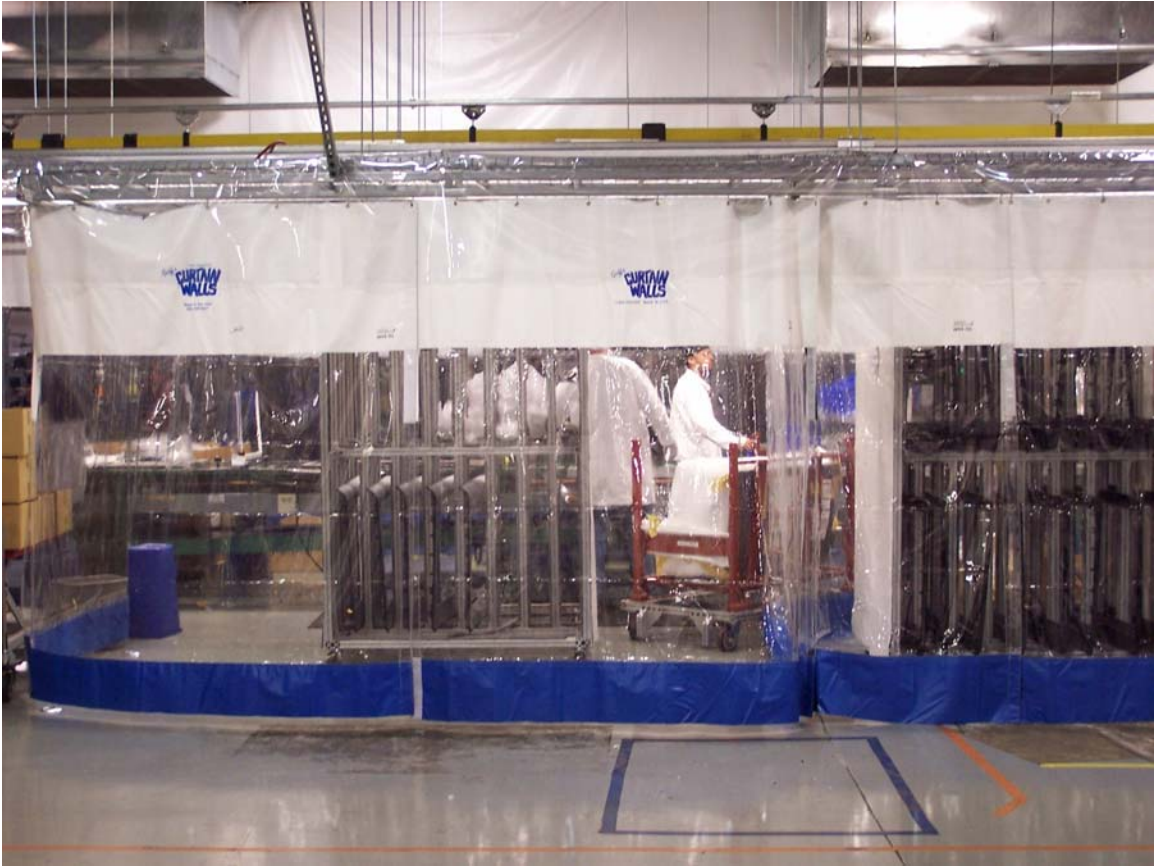
Like the Curtain Walls, the Power Roll roll-up door is made of 18-oz. vinyl and provides a tight seal around its whole perimeter. The top of the door is covered with a valance, the sides are surrounded by the guide track and the door panel has a generous bottom seal. Should a cart run into the door panel it will not tear and instead the curtain pops out of its guides. The rollers can be easily set back into position and is ready to do its job of sealing the door in no time.

Goff's Curtain Walls also surround the changing area, which leads to the assembly area through a Curtain Wall passageway. An air shower emerges from the floor of the changing area. Workers blow off their shoes and then slip on booties on their way into the assembly room. The passageway curtains are attached to the assembly curtains using Velcro straps.

For a company the size of Sony that is always transforming its product lines to meet market demands and constantly advancing technology, the curtain walls enclosure approach gives them the responsiveness they need. Observes Olsen, “If we change our manufacturing arrangement, we take down the curtains and use new space that matches our needs.”



This 80'x120' area is enclosed by Goff's Curtain Walls to match the conditions of a class 10,000 cleanroom.



Gooff's Curtain Walls surrounding the LCD production lines at the Sony Technology Center provide the means for debris and dirt management to maintain product quality.

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