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Critical Environment Solutions

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Worried About Cleanroom Costs?

Adding these energy-saving, maintenance-reducing features can save a bundle!

As cleanrooms grow in size and sophistication, energy demands go up significantly. Even worse, 24/7/365 operation puts substantial particulate loads on filters, increasing maintenance costs and possibly causing unpredictable – and expensive – cleanroom maintenance shutdowns.

To dodge these expenses, facility managers would do well to consider one or more add-on features when they specify a modular cleanroom. In particular, cleanrooms performing to stringent cleanliness standards benefit from modular HVAC and recirculating airflow designs, smart controls for fan, filter and lighting systems, and high-tech DC and room-side replaceable Fan Filter Units (FFUs). While all of these solutions add initial cost, they can make a significant difference in reduced energy costs and extended maintenance shutdown intervals. This provides a very rapid return on the initial investment in demanding cleanroom applications, often in little more than a year.

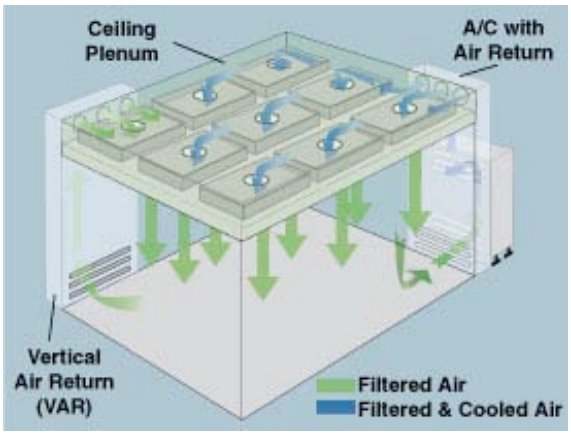
Here are some advanced approaches to improving cleanroom performance and productivity.

Air Conditioning and Recirculation

The existing high-volume air conditioning (HVAC) system that services the building surrounding your cleanroom may provide the most economical means to cool it. For larger or more demanding cleanroom applications, however, dedicated AC systems can reduce operating expenses by cutting energy use and minimizing maintenance shutdowns.

Air Conditioning Modules provide economical cooling in facilities without adequate HVAC. In many such applications, heat removed from the cleanroom is vented into the room in which the cleanroom is located. For more efficient operation, this heat can be exhausted outside the building. With larger cleanrooms, Terra works with a local contractor to install a split A/C system, which moves the heat-generating compressor outside the building to reduce heat loads inside the facility.

In all of these approaches, a double-wall, insulated ceiling plenum increases energy efficiency by allowing recirculation of cooled, filtered air. Ceiling plenums also increase filter life by reducing particle loads because recirculated air is cleaner than fresh air. AC modules provide just enough fresh make-up air to meet safety requirements (typically, around 20 CFM of fresh air per cleanroom occupant); the remainder of the supply air for FFUs routes to the ceiling plenum via vertical air returns. A properly designed air recirculation system can double or triple the operating interval between maintenance shutdowns, increasing cleanroom productivity.
More information on HVAC designs and recirculation . . .



Cleanroom with ceiling plenum, HVAC module and Vertical Air Return

Room-Side Replaceable FFUs

When filters finally do become clogged, air velocity and air change rates fall to the point that a facility can no longer maintain its target cleanliness rating. Replacing filters in a conventional FFU generally

entails substantial contamination of the cleanroom since the ceiling barrier must be breached in order to access the filters. That means re-cleaning, re-balancing, re-testing and re-certifying the cleanroom after every filter change!

Room-Side Replaceable Fan Filter Units (RSR FFUs) allow you to swap filters from within the cleanroom, quickly and with minimal contamination. Rather than breaching the ceiling and allowing accumulated dust to enter the cleanroom, you detach the filter assembly from inside the cleanroom while leaving the rest of the FFU in place. A gel seal and knife-edge on the filter housing provides excellent sealing from the weight of the FFU itself - with no separate gasket, no tools, no climbing all over the top of your cleanroom to dismantle FFUs.

Unified Power Distribution and EnergySaver FFU Controls

Terra cleanrooms feature Power Distribution Modules (PDMs) that provide cluster control and circuit protection of FFUs and lights. PDMs simplify cleanroom installation and maintenance, but they do not allow easy adjustment of fan speed from a convenient location.

Power Distribution Module (PDM)

EnergySaver Console

Terra's EnergySaver system does. This economical system interfaces with Terra's standard PDMs to allow variable control from a console mounted on the main cleanroom control panel, providing two key benefits:

Remote Air Balancing: Once you select the FFU zone on the console, you can adjust the fan speed up or down to "dial in" the proper air velocity, internal pressure, and air change rate. Because these zones generally correspond to separate rooms or processing areas, this variable control lets you balance FFU performance from one cleanliness zone to another, ensuring that you maintain the pressure gradients and air change rates required as you move from one cleanliness classification to another.

Further, as filters clog and air velocity decreases, the EnergySaver system lets you perform small speed adjustments that keep your cleanroom in spec. More on pressure, velocity, and air change rates associated with each cleanliness rating.

Cost Savings: EnergySaver keeps your FFUs running at optimal speed, moving just the right amount of air to keep the system within the prescribed cleanliness range. This performance efficiency extends the life of filters by eliminating unnecessary loading that results from operation at unnecessarily high speeds.

More importantly, EnergySaver systems cut you power bills. A programmable setback mode ramps down system operation during off-hours, which often amount to 70% of a typical week. This setback mode maintains the integrity of the cleanroom with much lower power consumption and heat generation than is required during working hours when contamination loads are much higher. Setback operation also reduces filter loading and maintenance, providing an added cost saving.

Energy savings typically pay for the investment in an EnergySaver system within the first 24 months of cleanroom operation. Terra provides more precise ROI estimates based on local energy costs and operation hours. More information on EnergySaver FFU controls . . .

Electronically-Commutated DC Motors
Also known as brushless DC motors, these cleanroom FFU motors have no brushes, less wear and particulate generation, and are significantly more energy efficient than either AC or conventional DC motors. An electronic controller replaces the brush, or mechanical commutator assembly, of the brushed DC motor, which continually switches the phase using a solid-state controller. These capabilities also make FFUs with Electrically-Commutated DC motors the ideal choice for smart control, as speed and torque can be reliably predicted and managed.

These approaches to airflow design, FFU and light control, and FFU motor technology all contribute to substantial long-term cost savings.