

CASE STUDY: Complex Design/Build Make-Up Air System for Fortune 500 R&D

Client Overview and Challenge

Last year, a Fortune 500 company and long-standing MSC client approached us about replacing three aging and unreliable make-up air units at their Research and Development facility.

Each of the existing units served individual chambers, or “cells”, where combustion engines are tested around the clock for days at a time. The new units



had to meet precise parameters and would require numerous added features due to the demanding nature of the testing. Incorporating these necessary upgrades drove the estimated cost beyond the allocated budget. This raised the question: Could MSC provide a more practical customized solution meeting the requirements for all three testing cells while keeping project costs in check?

Customized HVAC Solution

MSC’s team of mechanical and controls engineers met at length to exchange ideas and devised an innovative plan. We would design a single indoor make-up air unit and corresponding control system capable of serving all three testing cells. The unit would be custom-built and tested at our facility prior to installation to streamline project execution in alignment with the client’s annual plant shutdown.

The client’s Research Director provided us with the required output tolerances, which were identical for all three cells. There could be no deviation between the spaces to maintain the integrity of the engine testing. The dry bulb temperature had to maintain $\pm 1^\circ\text{F}$; for comparison, the tolerance for standard units is usually $\pm 2^\circ\text{F}$. The required dew point tolerance was $\pm 2.5^\circ\text{F}$ from 54°F , surpassing the stringent specifications typical for hospital operating rooms. Additionally, the facility required the flexibility to shut off airflow to individual cells that were not in use.

Design and Implementation

Our engineering team leveraged decades of experience in complex design/build projects with strict output parameters, refining the design through several iterations to arrive at the final plan. Significant consideration was given to material availability due to known shortages and long lead times. The design was for a 100% outside air system ducted directly to an exterior wall louver. The new system

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would integrate with two existing electrical circuits and a third circuit would be added.

Steam humidifiers serving the three units slated for replacement were directly fed with very hard water from the municipal water supply, resulting in excessive deterioration and frequent service failures. To achieve the stipulated tolerances in the new unit while ensuring reliable system performance, a dedicated built-in R/O water treatment system was imperative.

Lastly, the unit, which would weigh in at nearly 2,500 lbs., had to be compact enough to negotiate multiple doorways and 90° turns in the corridors leading to the mechanical room on the opposite side of the facility. This would require a total dimensional tolerance of less than one inch.

After extensive planning, calculating, and measuring, our engineers selected and procured hundreds of parts, components and pieces of equipment before setting about the painstaking work of building the unit in house and testing its controls over the course of several months. One of the client's strict requirements was to minimize downtime for the facility, so installation was scheduled to take place during a two-week period surrounding Christmas and New Year's. Our team of technicians and engineers worked diligently and put in long hours installing the unit to have it ready for startup within the required timeline, even reaching partial turnover two days earlier than planned.

Startup and Commissioning

The startup and commissioning process entailed verifying dry bulb and dew point temperature tolerances over several days using NIST-traceable instruments, taking duct traverse readings to measure and adjust supply air volume to the three separate cells, and fine-tuning the system controls. Dry bulb readings fell comfortably within the required tolerance of $\pm 1^{\circ}\text{F}$. On dew point performance,



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which can be difficult to control, MSC was able to achieve $\pm 0.7^\circ\text{F}$ – well within the client’s requirement of $\pm 2.5^\circ\text{F}$. The unit continues to meet all specifications as illustrated in the August 2023 graph below.

Conclusion

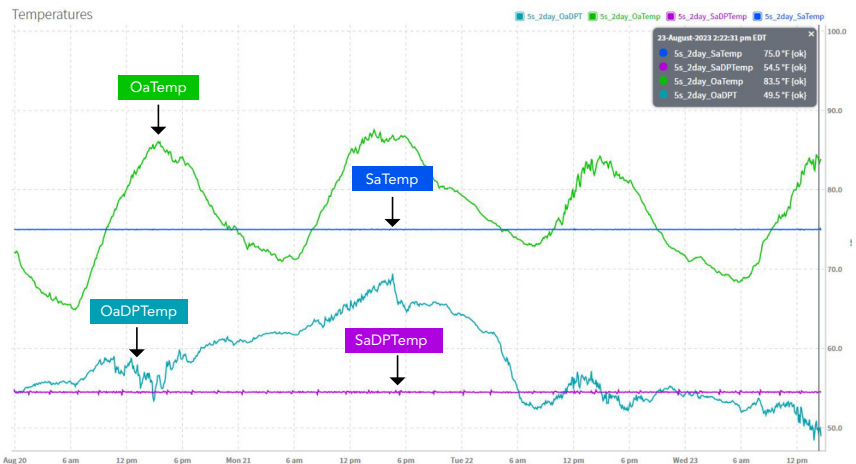
By designing a singular make-up air unit capable of controlling the three separate testing cells, MSC’s design/build team met all of our client’s rigorous multifaceted needs while significantly exceeding their required performance parameters.

CHARTED TEMPERATURES – 3.5 DAYS

- Outside air temperature (OaTemp)
- Supply air temperature (SaTemp)
- Outside air dew point temperature (OaDPTemp)
- Supply air dew point temperature (SaDPTemp)

*Outdoor air dry bulb temperatures typically can vary by $\sim 25^\circ\text{F}$ over the course of a day. MSC’s 100% outside air unit reliably produces **supply air dry bulb temperatures** within $\pm 1^\circ$ of setpoint.*

*Likewise, the unit accommodates wide **outside air dew point temperature** fluctuations to deliver **supply air dew point temperatures** falling well within the required tolerance of $\pm 2.5^\circ\text{F}$.*



Celebrating Our Colleague Steve Meigh on His Well-Earned Retirement



After a long and distinguished career in life safety, medical, and HVAC service sectors and 16 years at MSC, Steve Meigh is bidding farewell to his professional journey. Steve has made an indelible impact on clients and colleagues alike with his commitment to excellence and outstanding leadership.

Since joining MSC in 2007, Steve has been a key player in our success. As a Contract Service Specialist, he served as a dedicated client partner with a deep understanding of their diverse needs. As a colleague and friend, he is a steadfast and supportive ally known for his quick wit and engaging demeanor. His ability to always find levity has undoubtedly strengthened our team bonds and culture of collaboration.

As Steve embarks on his well-deserved retirement, we at MSC thank him for his dedication, positive leadership, friendship, and the camaraderie he brought to the team. We consider ourselves fortunate to have worked alongside him and wish him a happy and fulfilling future of family, friends, and leisurely pursuits.

Mid-Atlantic Buildings and Facilities Management Trade Show



Last month, MSC showcased our expertise as a service specialist in HVAC, process cooling, and building automation at the 17th Annual Mid-Atlantic Building and Facilities Management Trade Show (MABFM) in Edison, NJ. The event was a huge success, providing numerous opportunities to forge new connections with facilities management professionals and industry partners. We anticipate many mutually beneficial alliances in the future and look forward to exhibiting at MABFM again in 2024.