



CASE STUDY: AIRFLOW MEASUREMENT SYSTEM (AFMS)  
Creating consistent, balanced and  
measureable air quality for  
Children's Minnesota



Children's  
MINNESOTA

## EXECUTIVE SUMMARY

**The hospital's Midwest Fetal Care Center struggled with maintaining proper room pressurization and ventilation.**

The Minneapolis hospital of Children's Minnesota faced challenges in maintaining proper room pressurization and ventilation levels, impacting the Midwest Fetal Care Center. Harris, a leading national mechanical contractor, and KMC Controls, a recognized expert in HVAC control, provided a sustainable solution using the KMC Airflow Measurement System (AFMS). The collaboration resulted in immediate, positive results, including reliable measurement data for outside, return, and supply airflow rates, ensuring a balanced pressurization schema and greater confidence in environmental quality. The AFMS implementation also promises long-term benefits, including Advanced Fault Detection and Diagnostics (AFDD), virtually zero maintenance, and a test case for transitioning the hospital's Building Automation System (BAS) to an open protocol.



## CUSTOMER PROFILE

Children's Minnesota is a prominent pediatric health system with a Level I Trauma Center, known for its excellence and commitment to children's healthcare. Partnering with Harris, a long-time advocate of KMC Controls, the hospital sought a solution to address pressurization and ventilation issues.





## THE CHALLENGE

The hospital's Midwest Fetal Care Center faced persistent challenges in maintaining proper room pressurization and ventilation levels according to ASHRAE Standard 170. The commissioned Air Handling Unit (AHU) struggled due to unreliable measurements from thermal dispersion Airflow Measurement Devices (AMDs). The thermal dispersion AMDs suffered from accuracy drift over time, necessitating frequent operational modifications.

The BAS's control schema, featuring independently operated relief and return dampers, exacerbated performance issues and complicated fan speed balancing.



The commissioned Air Handling Unit (AHU) struggled due to unreliable measurements from thermal dispersion airflow measurement devices.



Independently operated relief and return dampers exacerbated performance issues and complicated fan speed balancing.



Over 100 linear feet of OA ductwork feeds the AHU. This duct configuration—including sharp bends (above) and an OA booster (below)—deviates from ASHRAE Standard 111 requirements for accurate measurements using traditional airflow measurement devices.

Additionally, the unit's duct configuration deviated from ASHRAE Standard 111 requirements for accurate measurements using traditional AMDs. This setup resulted in downtime during servicing, impacting hospital operation, and Harris faced a burden dispatching technicians for manual adjustments.

The overarching challenge was the need for a sustainable solution that addressed both technical intricacies and operational disruptions. Children's Minnesota sought a resolution to ensure consistent pressurization, ventilation, and system performance, paving the way for the collaboration with KMC Controls and the implementation of the KMC AFMS to meet these multifaceted challenges.

## ENGAGEMENT AND EXPERTISE

KMC Controls, chosen for its HVAC control expertise, collaborated with Harris, leveraging their 30-year partnership. The hospital, with over 1200 KMDigital controls, engaged KMC Controls to address the challenges as well as transition to an open protocol BAS.



## THE SOLUTION



Outside, return, and mixed air (pictured) temperature sensors were installed.



Airflow measurement probes were installed on the supply (pictured) and return fans.



Data integration with the AFMS (green) was achieved through BACnet/IP over Ethernet.

The hospital's challenges with room pressurization and ventilation were met with a comprehensive solution by using the KMC AFMS. Harris initiated the collaboration, providing preliminary details, and a KMC Controls sales engineer conducted a thorough site walkthrough. This process facilitated the creation of a project takeoff and bill of materials for the subsequent installation.

KMC Controls' expertise guided the reuse of existing sensors and the selection and location of new sensors, ensuring an optimized solution. The AFMS inclinometer was strategically mounted on the outside air damper, while airflow measurement probes were installed on the supply and return fans. To maintain the existing BAS, data integration was achieved through BACnet/IP over Ethernet.

Upon configuration, Characterized Airflow Performance™—the measurement technology utilized by the AFMS—provided accurate readings consistent with ASHRAE Standard 111 criteria.





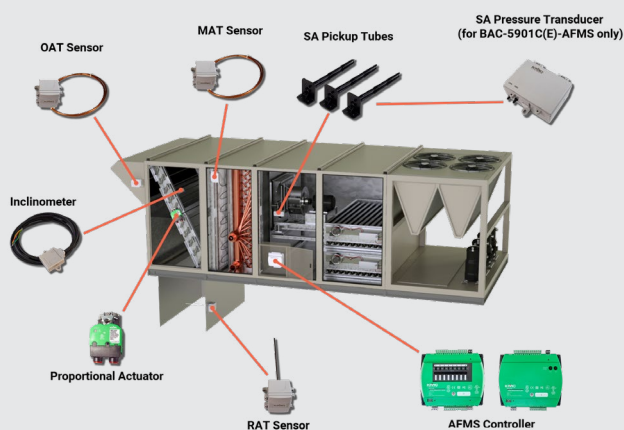
**Built on ASHRAE standard measurement methods, the patented KMC Airflow Measurement System (AFMS) delivers accurate, repeatable measurements in nearly any equipment type.**



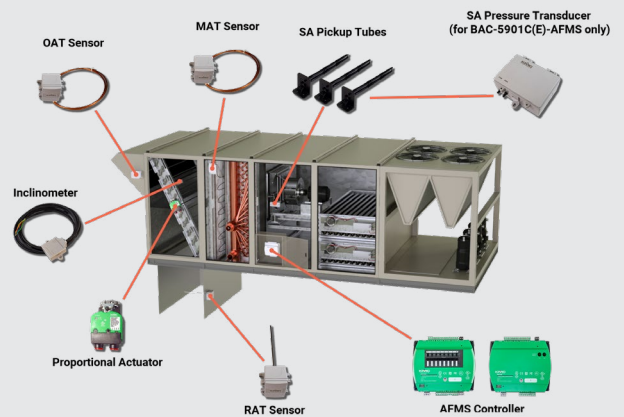
Achieve precise and consistent supply, outside, and return air flow measurements across a wide range of equipment with the KMC AFMS.

From small, packaged rooftop units to large, built-up air handlers, this innovative solution ensures reliable and efficient HVAC operation for enhanced performance and maximum energy savings.

## ACCURATE, REPEATABLE MEASUREMENTS FOR OPTIMAL PERFORMANCE

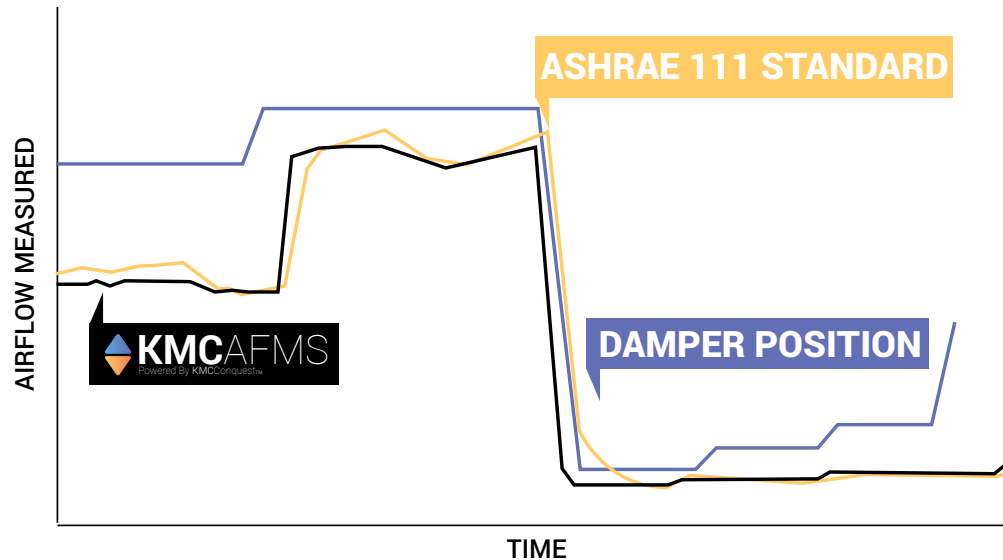


Standard Rooftop Unit (RTU) Application



Air Handling Unit (AHU) Outside Air Damper (OAD) Pressure Assist

## SUPERIOR ACCURACY.



This data shows airflow measurements at varying damper positions for multiple sensing technologies. The data is captured from an office building in Connecticut with a constant volume system. Data was trended over an hour, during normal weather conditions, and the system was allowed to stabilize at each damper position. The grey line represents damper position. The blue line represents the airflow measurement from the KMC AFMS, and the gold line represents calculated airflow using the Temperature Ratio Equation – as a trusted ASHRAE standard. The KMC AFMS measures and tracks closely to the standard based on independent testing.

## TOPLINE

- Patented KMC Airflow Measurement System can be installed across a wide range of equipment
- Balance high system performance and energy efficiency with accurate measurements of fresh air exchanges with conditioned outside air to meet your IAQ goals
- Accurate supply, outside and return airflow measurements determined from characterized airflow performance
- Provides OA, SA, and RA flow data for monitoring and control
- Delivers accurate, repeatable results on any type of equipment, without traditional mechanical limitations, performance issues, or ongoing maintenance challenges
- Based on ASHRAE standards 62.1, 111, 189.1
- Standalone measurement or communication via BACnet
- Integrated fault detection and diagnostics facilitate compliance with standards and provide peace of mind





Characterized Airflow Performance™ provides accurate readings consistent with ASHRAE Standard 111 criteria.

## IMMEDIATE RESULTS

The AFMS delivers reliable measurement data for outside, return, and supply airflow rates, ensuring balanced pressurization. The hospital is now equipped with a reliable and sustainable airflow measurement solution, instilling greater confidence in the space's environmental quality.

Furthermore, the ability to view key statistics through a wall-mounted NetSensor—such as Air Changes per Hour and AFDD troubleshooting basics—provides valuable insights.

Harris, as a partner, gained practical experience in installing the KMC AFMS and balancing complex AHUs, further enhancing their capabilities and expertise.

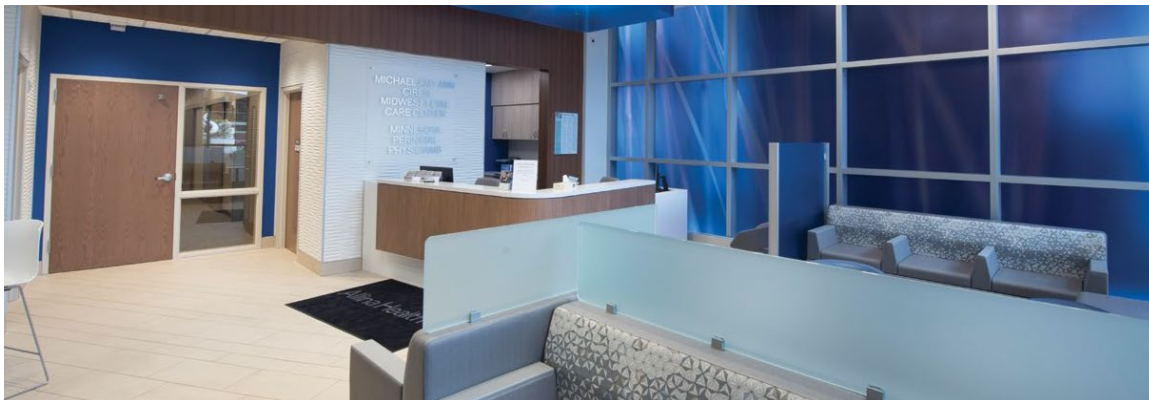


## LONG-TERM BENEFITS

The hospital gained a valuable tool for trend analysis over time, enabling proactive maintenance and performance metrics tracking. The embedded AFDD of the KMC AFMS provide continuous monitoring, enabling ASHRAE Guideline 36 AFDD routines. For example, the OA damper position feedback reported by the inclinometer allows for continuous monitoring of damper blade deterioration and hysteresis in damper actuator linkages.

Long-term reliability is ensured, as the KMC AFMS consistently monitors all measurements for accuracy drift. The AFMS can reestablish the performance curve on demand, reducing the unit's downtime and minimizing the need for maintenance or recalibration. The hospital benefits from virtually zero maintenance for the life of the installation, ensuring optimal performance and efficiency over time.

In addition, this test case for migrating to BACnet/IP devices offers a path toward a more open and standard protocol for the hospital.

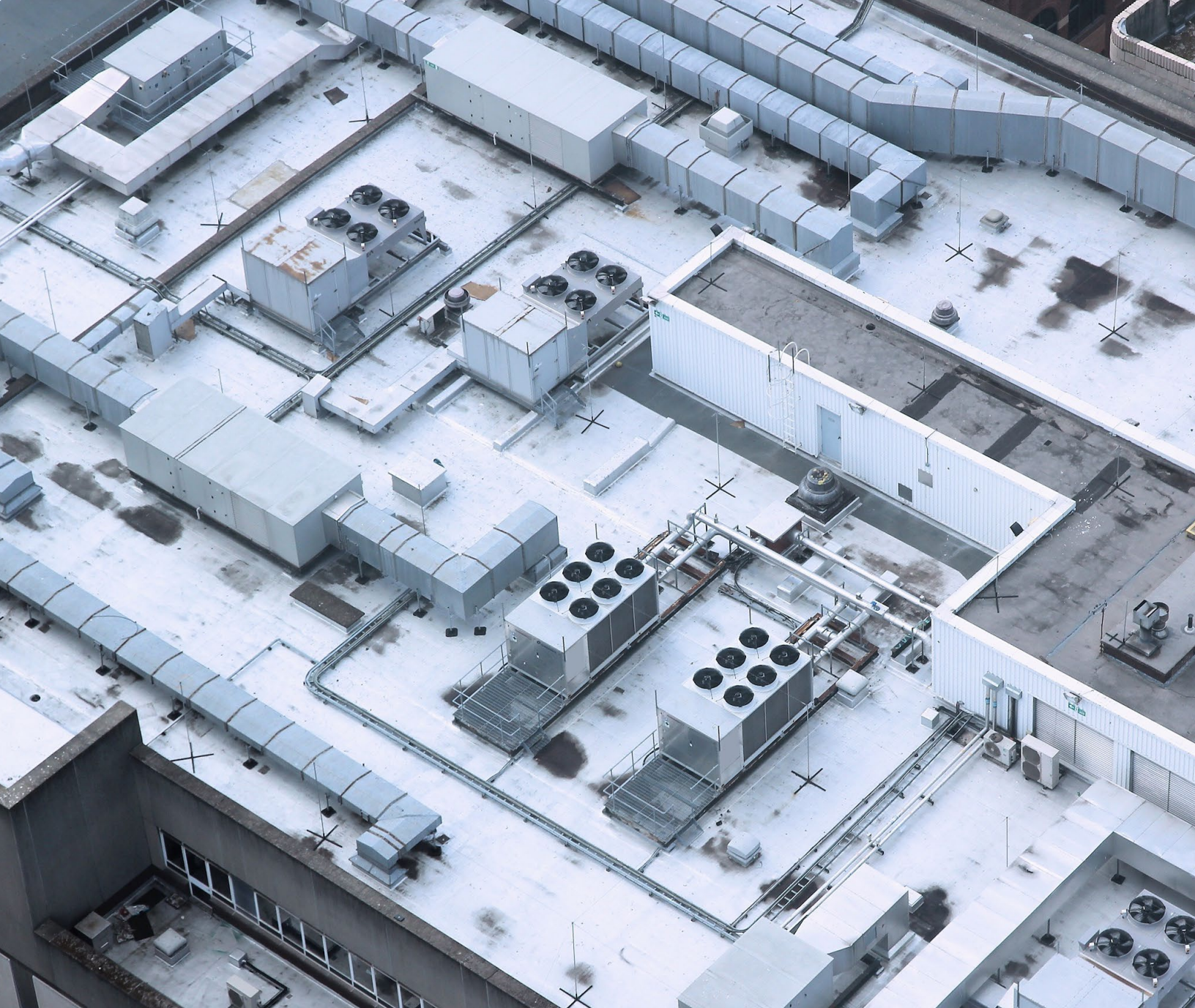


## CONCLUSION

The KMC AFMS successfully addressed the hospital's challenges, providing an efficient, cost-effective, and sustainable solution. This case study demonstrates the value of KMC Controls' expertise in HVAC control, offering long-term benefits for healthcare facilities. Facilities managers can trust KMC Controls' solutions to enhance HVAC performance, ensuring optimal environmental conditions for occupants. For more information about the KMC AFMS, please visit the AFMS solutions page or contact the KMC Controls sales team.

**LEARN MORE AT [WWW.KMCCONTROLS.COM/AFMS/](http://WWW.KMCCONTROLS.COM/AFMS/)**





KMC is a generational community of innovative people committed to delivering world-class technology. We stand for empowering positive impacts by supporting our people and our customers. Headquartered in New Paris, Indiana we have worked for more than 50 years in building automation including engineering, manufacturing, distribution and support. We are committed to open, secure, scalable systems and liberated data to help our customers achieve their goals.

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