Meeting Expansion Requirements Using a Diversity Design

for Milliken Research Corporation

> "To add so many hoods without this type of control, would have resulted in the walls caving in."
>
> **Steven Brown**
> **Senior Development Chemist**

Background

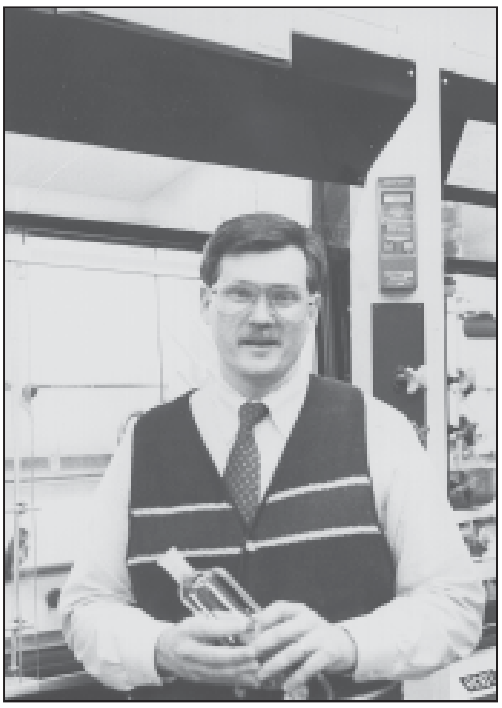
The company slogan reads: "Quality Leadership Through Research." Not only does Milliken have the world's largest private textile research organization, it is quite arguably the finest. Milliken Research Corporation is a separate entity that reflects the importance that corporate leadership has placed on research through the years.

Working directly with customers such as Hyatt Regency, Opryland, L.L. Bean, Ford Motor Company, McDonald's, and crayon manufacturer Binney & Smith, company researchers strive for new solutions and develop new products at Milliken Research Center in Spartanburg, South Carolina. So when the decision was made to expand the laboratory facilities at Spartanburg, it was expected to be accomplished with minimal disturbance to researchers and to meet their exacting standards of quality.

As winners of the prestigious Malcolm Baldridge National Quality Award in 1989 and the European Quality Award in 1993, everything Milliken does is based on 100% quality.[1]

The Challenge

This commitment to quality has resulted in continued market growth for the company and the need to expand the laboratories at Spartanburg. Originally built in 1965, the Roger Milliken Research and Customer Center needed to add 23 new fume hoods, doubling its capacity. The original laboratories were constructed with a dual duct system, using the best equipment available at the time. While still functional, the building's original mechanical equipment could provide



Milliken's Senior Development Chemist Steven Brown.

[1]excerpted from *Textile World 23rd Annual Model Mill*, June 1995

only half the amount of air handling capacity needed to support the additional fume hoods. Installing new air handlers and ductwork in the building would result in three months of downtime for the researchers — a situation that was unacceptable. Unless the mechanical engineer could find a way to satisfy the owner's request, the only alternative would be to construct a new facility.

The Solution

The success of this project hinged on the resolution of two objectives which at first appeared at odds with one another – increase the number of fume hoods in the building by 100% and use the existing mechanical system. A solution was found by applying the concept of diversity and using a control system known as Usage Based Controls™ (UBC) to automatically adjust airflow depending on the presence or absence of operators working at their fume hoods. The concept of diversity recognizes the probability that not all or only a small percentage of the fume hoods in a laboratory will be operating at maximum capacity at any given time. For a typical research laboratory, studies have shown average fume hood usage to be one hour per day. Ensuring the safety of each operator is a Zone Presence Sensor™ (ZPS), which is mounted on the front of each fume hood. The ZPS, working in conjunction with the standard components of the Phoenix Controls system, automatically reduces or increases the exhaust flow of a hood depending on the absence or presence of an operator within its detection zone. Taking advantage of every opportunity to *safely* reduce the airflow of unoccupied fume hoods can reduce energy consumption by 40% or more. This airflow reduction provides safe containment while dramatically reducing airflow requirements. For Milliken, being able to design with approximately 50% diversity meant all the difference — laboratory space could be renovated and office space converted to new laboratories to accommodate the need for expanded laboratory capacity. Existing mechanical equipment was adapted to support the new expanded system with no additional capacity required. Mechanical system capital additions, as well as the expense of constructing a new facility, were avoided. Existing fume hoods were also fitted with UBC controls, fully integrating them with the new system.

Installation

This was a fast-track project, expected to be completed in three months. The building was kept in operation during the construction phase with little interruption in the existing laboratories. William Ayres, Milliken's Senior Engineer, emphasized that minimizing any downtime in research was a key criteria for this project. Commenting on the process, he observed "operations continued throughout the installation with a minimum amount of disturbance to researchers who were often within 15 to 20 feet of workers." Air volume regulators in the dual duct mixing boxes were removed. Existing pneumatic hot and cold dampers were left unchanged to control temperature. Phoenix valves were installed in the supply duct, downstream of the mixing box to control the volume of air.

Steven Brown, Senior Development Chemist, was directly involved in the decision-making process. His first concern was safety, especially since he was unfamiliar with Usage Based Controls and the ZPS. Working with the new system on a daily basis, those concerns were quickly alleviated. After six months of operation, Brown does not feel there has been a situation where operator safety has been compromised. Commenting on the experience he and his staff have had with the UBC system, he said, "We are all amazed – the fume hood goes from a resting stage to full flow in the blink of an eye." In describing the large laboratory, with eight side-by-side fume hoods, Brown further observed that "to add so many hoods without this type of control, would have resulted in the walls caving in."