

Optimal Operation and Control of Heat Recovery System in the Laboratory Air Handling Unit System

Y. Cui and M. Liu

Most modern laboratory buildings include both office and laboratory sections. The two sections are conventionally served by dedicated Air Handling Units (AHUs). Due to the requirement for a large amount of outside air, the thermal energy consumptions of laboratory buildings are often several times higher than that of typical commercial buildings. To reduce the thermal energy consumption, several energy efficient measures have been developed and implemented during the past thirty years.

One of the more recent developments is the Laboratory Air Handling Unit (LAHU). This system allows the return air from the office section to flow either upstream or downstream of the cooling coil for the laboratory section. Consequently, economizers can be implemented in both the office and the laboratory sections. It also allows different supply air temperatures to the office and the laboratory sections to minimize building reheat.

Optimal airflow control schedules for LAHU have also been developed. When the optimal airflow control schedule is implemented, the LAHU can save over 30% of thermal energy consumption compared with traditional systems. It also improves the office section indoor air quality, due to increased outside air intake.

The heat recovery system, one of the energy conservation applications, has been commonly used in the laboratory buildings. The outside air is preheated in winter and pre-cooled in summer using exhaust air to pre-condition the outside air to the supply air conditions. Since LAHU system allows economizer operation in both the office and laboratory sections, the conventional operation and control schedules may not apply to the LAHU systems.