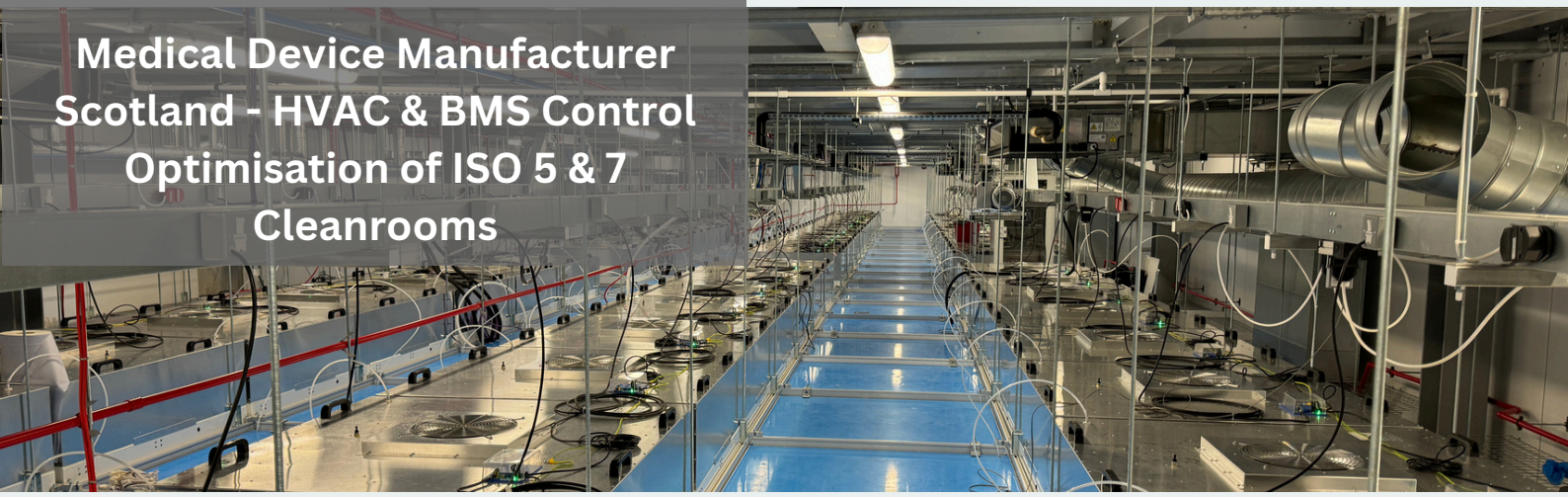
Case Study

Global Project Engineering

Medical Device Manufacturer Scotland - HVAC & BMS Control Optimisation of ISO 5 & 7 Cleanrooms



Background

This medical device manufacturer in Perth, Scotland, undertook a targeted HVAC and Control System Optimisation programme. The initiative focused on improving operational efficiency and reducing electricity consumption across several ISO 5 and ISO 7 cleanrooms and their associated ancillary spaces.

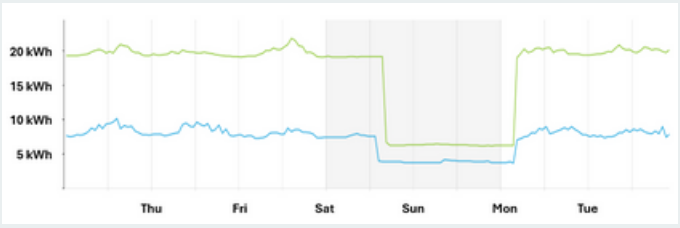
Solution

The optimisation strategy included the following key measures:

- HVAC air distribution rebalance to meet room demands
- Reducing room pressure cascade
- Synchronising operation of the Air Handling Units and Fan Filter Units
- Enhancing BMS controllability to enable transparent switching between occupied and unoccupied modes
- Implementing air temperature deadband control

Data Analysis

Energy and operational data were collected from the Building Management System (BMS) and the site's energy management platform before and after optimisation. The results below show the impact of improvements applied to 186 Fan Filter Units.

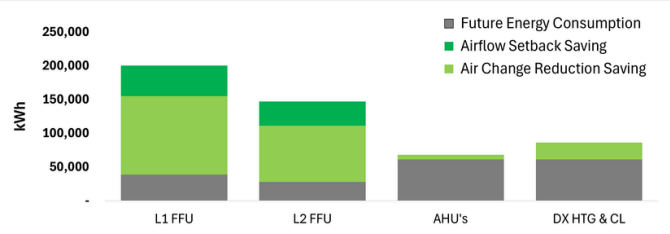


Load Profile Comparison:

- Pre-optimisation (green line): Peak consumption was between 19 and 22 kWh during occupied hours and 6 kWh during unoccupied hours.
- Post-optimisation (blue line): Consumption was reduced to 8 to 10 kWh during occupied hours and approximately 6 kWh during unoccupied hours.
- An 81% reduction in electricity consumption was achieved from the optimisation of the Fan Filter Units.
- A further 10% saving was achieved from the main fresh air AHUs, and a 29% saving to the DX cooling/heating systems.

Results

- Significant reductions in Fan Filter Unit energy consumption were achieved while maintaining the recommended face velocity of 0.45 m/s ± 20%.
- AHU fan energy consumption decreased with improved control of the room pressure cascades to achieve a minimum of +10 Pa between different room classifications.
- DX reverse cycle heating and cooling control was optimised on the AHUs and the local DX cooling only units within the cleanroom air plenums, thereby eliminating simultaneous heating and cooling.



Implementation

Comprehensive documentation was prepared and reviewed with the site's Engineering and Quality teams. This included the Functional Design Specification, Description of Operation, Scope of Works, Quality Risk Assessments, Safety Risk Assessment, and IOQ documentation.

The work on site was carried out in two distinct stages: first on level 2, then on level 1. Each stage was completed within a four-day period, which included rebalancing the air volume and pressure cascade setup, BMS control modifications, air particle testing, and the final IOQ procedure.

Conclusion

The HVAC and Control Optimisation programme delivered a total annual energy reduction of 312,300 kWh. This accounts for 62% of HVAC energy and 12% of total site electricity. This achieved a total annual cost saving of £78,055.

These outcomes illustrate the substantial value of data driven HVAC optimisation and highlight the importance of continuous monitoring and fine tuning to deliver sustainable energy savings.