OPTIMISATION OF VENTILATION PAYS OFF

Novo Nordisk A/S manufactures medical products and uses ventilation extensively in its production. By reassessing needs and improving system efficiency, Novo Nordisk optimised ventilation in one of its factories. This led to annual savings of 848 MWh electricity.

Novo Nordisk A/S, Bagsværd

PRODUCTION
Medical products

INITIATIVE
Optimisation of ventilation plant

RESULT
Energy savings of 848 MWh electricity per year

Economy

848 MWh
Annual electricity savings

0.5 M DKK
Annual savings

26 %
Annual savings

The result

- Annual saving of 848 MWh
- Annual financial saving of DKK 0.5 million (approx. EUR 67,000)

How much did it cost?

Investments were made in connection with other refurbishments and are likely to be recouped in less than 3 years.

Why was the project carried out?

The aim was to optimise ventilation in one of the company's filling factories in Bagsværd, on Zealand. Four balanced ventilation systems were identified and subjected to thorough analysis of current ventilation needs and requirements.

This included looking at operating pressure, airflow and set points for humidification. The design and configuration of the ventilation systems were also analysed to identify pressure losses, clean steam consumption and the potential to reconfigure filters.

How was the project carried out?

Optimisation comprised four separate initiatives:

- Adjusting operating pressures in injection and exhaust systems
- Reconfiguring filters in injection systems
- Adjusting set points for humidification, heating and cooling
- Reducing airflow

Adjusting operating pressure

The operating pressures in four injection systems and in one of the exhaust systems were adjusted to individual values that ensure required and sufficient operating pressures above the automatic airflow regulators. The changes took account of the increase in pressure

drop (between filter changes) above the filters located after the airflow regulators. The adjustment has reduced the operating pressure in the systems and thus reduced energy consumption for operating the electric motor by 121 MWh per year.

Reconfiguring filters

The reconfiguration of the filters contributed an annual energy saving of 56 MWh. The saving was possible because the ventilation systems had an unnecessarily high operating pressure, due in part to pressure drops above the filters. Replacing G5 panel filters, which are quick to clog up, with F7 bag filters, improved filtering and reduced energy consumption.

Moreover, double HEPA filtration was removed and F9 filters were moved to where the HEPA filters used to be, and where the sectional area is larger. By increasing the filter area in this way, the efficiency of the F9 filters is increased, resulting in a reduction in pressure loss.

The new filter configuration also led to lower pressure in the units after the ventilator, improving leak-tightness. One door used to leak several hundred cubic metres of air an hour. The lower pressure means that it is now easier to seal the door.

Adjusting set points

Adjusting set points for humidification, heating and cooling has provided the largest energy saving of 564 MWh annually. The savings have been achieved by expanding the thresholds for humidification and dehumidification in three injection systems (70,000 m^3/h).

So, now the system has to be drier before humidification is commenced and wetter before dehumidification is commenced. The change was followed up by a thorough study of the environment before and after the change. The study showed no negative effect of allowing a greater interval for the moisture content.

Reducing airflow

Finally, the airflow was reduced in two injection systems that operate in parallel. Unnecessarily high airflows led to unnecessary energy consumption to operate the electric motor. Account was taken of the fact that different components have different changes in pressure drop at a reduced airflow rate, and that the efficiencies of motors, drives and ventilators change at the changed operating point. The energy saving from the initiative is 107 MWh electricity annually.

What were the results of the project?

Optimisation of the four ventilation systems resulted in total savings of 848 MWh in the form of reduced need for electricity for motors in the systems and reduced need for clean steam for humidification. Furthermore, the initiative has given new knowledge and insights into system operations and energy consumption.

The figure below shows the energy savings achieved for one of four ventilation systems by reducing air change by 10 % (from 10,000 to 9,000 m^3 per hour). This initiative alone has cut electricity consumption by 26 %.

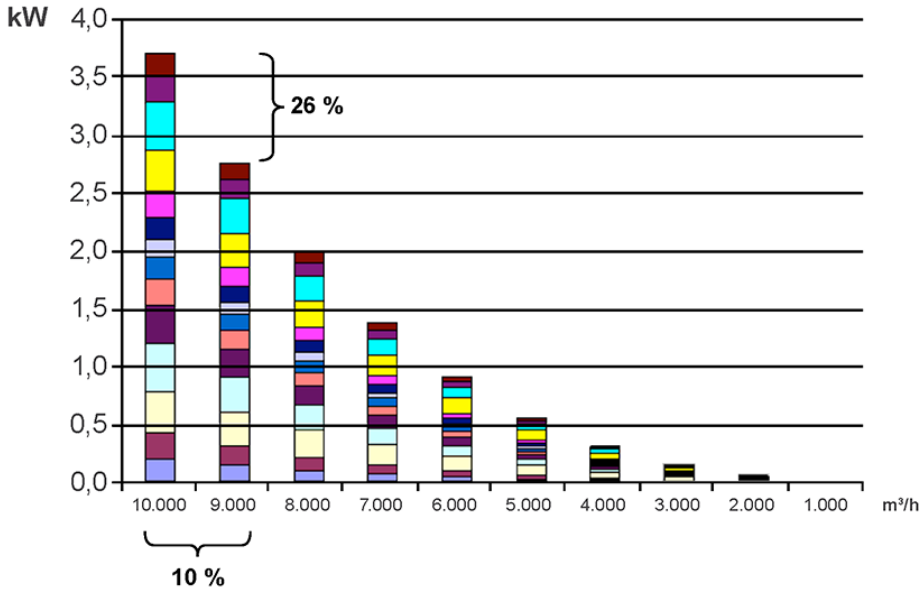

Figure 1: The coloured columns show pressure losses throughout the system (at filters, dampers, cooling/heating coils, etc.) as a result of the reduced air change. Furthermore, the figure illustrates where in the system most energy is lost and thus where to make changes, e.g. remove unnecessary components such as superfluous dampers.

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