The energy consumption of professional kitchens can be halved easily

Professional kitchens consume a significant amount of energy when compared to other spaces on a property. Through correct design of the kitchen ventilation, the energy consumption can be cut in half. This results in greater profitability for the restaurant business and at the same time improves work conditions considerably.

Professional kitchens often consume unnecessarily large amounts of energy. With current technology, exhaust air flow rates can be cut by 60%, supply air heating energy by 85%, and electricity by up to 95%. Therefore, 50% savings in energy consumption can be achieved easily. Everything depends on the co operation of designers and utilisation of existing, proven technology.

In practice, the savings in ventilation energy consumption are achieved by taking into account the following factors:

- positioning of kitchen appliances in a practical manner
- the best possible efficiency of extraction hoods and/ or a ventilated ceiling
- correct pressurisation of kitchen and adjoining spaces
- air distribution of the supply air in the kitchen that does not disturb exhaust air flows
- heat recovery from exhaust air
- demand-based ventilation in the kitchen

Typically, ventilation in a commercial kitchen operates at 100% of capacity, regardless of kitchen appliance usage. The energy consumption can be cut significantly through adoption of demand-based ventilation. Savings are then achieved in both heating and electricity consumption. Similarly, constantly operating ventilation systems waste heating energy. Heat can be recovered from the exhaust air and used either for heating supply air or for heating water with a heat pump.

Energy savings affect profitability in the restaurant business substantially. A typical luncheon restaurant can save thousands of euros every year by using energy-efficient ventilation. At the same time, customer and employee satisfaction is improved.

A well-functioning indoor climate – creating good work conditions

Indoor climate has a great impact on people's satisfaction, performance, and health. The significance of indoor climate is emphasised in professional kitchens, where the work conditions are very challenging. In addition to high temperatures, problems are often caused by draughts, excessive humidity, heat emissions from appliances, noise, and poor air quality. It is worth noting that well-functioning ventilation can reduce all of these problems as well as help to create pleasant and healthy working conditions.

Ventilation is needed in professional kitchens for the following reasons:

1. to remove smells and grease particles caused by the cooking process
2. for meeting hygiene requirements
3. to extract heat and humidity caused by food preparation and dishwashing
4. to create comfortable, healthy, and productive working conditions

The above-mentioned factors require ventilation with which smells and impurities as well as heat can be effectively removed from the work area. Additionally, the ventilation must prevent impurities from spreading to adjoining spaces, by maintaining underpressure of the kitchen areas in comparison to proximate spaces. Underpressure is achieved in practice by maintaining an exhaust air flow 10% higher than the supply air flow in the space.

Excessive heat, smells, and smoke caused by cooking can be eliminated effectively with a well-designed ventilation system. The main elements of a well-functioning system are adequate exhaust air flow and correctly located exhaust air and supply air units. Additionally, exhaust and supply air flows must be measured and adjusted to meet the design requirements.

The significance of kitchen ventilation design

Decisions made during the design phase that reduce the designed air flows have a direct influence on both investment and running costs. Sensibly designed

air flows reduce investment costs for ductwork, fans, supply air equipment, and heating and cooling equipment. Smaller air flows affect electricity and heating costs directly. Decreasing the maximum and junction power required from those stated in the energy tariff also lowers running costs.

Supply air units must be positioned in a manner ensuring that supply air flows won't cause unpleasant draughts near the exhaust air hoods. For the best possible end result, commercial kitchen ventilation should be designed as a complete entity: design concentrating merely on exhaust equipment may lead to a poorly functioning solution. The best alternative is, if the size of the kitchen so allows, to use displacement ventilation. Mixing ventilation demands 1.2 times the exhaust air flow demanded by displacement ventilation to reach similar extraction results.

The locations of kitchen appliances have a great effect on the air flows required. Kitchen appliances should be placed near walls whenever possible. For comparison of designs when the desired extraction results are the same, an appliance island in the middle of the space demands 1.6 times the exhaust air flow of a group of appliances placed near the wall.

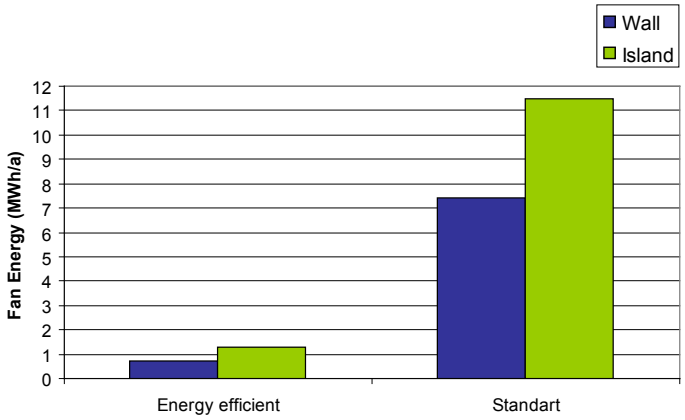
Hood efficiency can be improved with a capture air jet. Research shows that a traditional hood without a capture jet requires 1.3 times the exhaust air flow to reach the same efficiency.

Through recovery of heat from exhaust air, the energy-efficiency of the entire facility can be improved. For example, supply air can be heated with the recovered heat from the exhaust air flow. With a typical 50% heat recovery efficiency, heating costs can be halved.

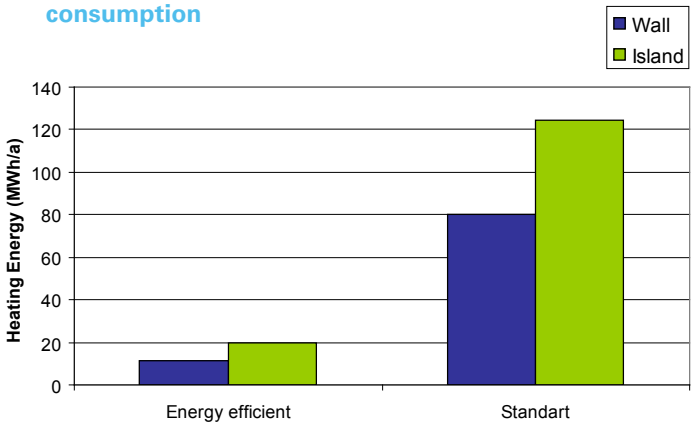
For a heat recovery system to work smoothly, a well-functioning mechanical grease extraction unit is adequate for light food preparation processes. In the design of a heat recovery system, it is crucial to measure the exhaust air's dirtiness and, if necessary, use a more efficient filtering solution than mechanical grease extraction units – e.g., UV technology.

It is also easy to achieve considerable savings on heating energy and on electricity by using demand-based ventilation, where the exhaust air flow rate is adjusted according to the actual use of the appliances. The savings depend on the actual usage of the appliances. In most cases, the appliances are used to less than 50% of capacity. In these cases, demand-based ventilation can cut ventilation energy consumption in half.

The effect of design concept on fan energy



The effect of design concept on heating energy consumption



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