

Catering for a Sustainable Future, Group

Prime Cooking ~ Energy Efficiency

A catering facility can be divided into the various functions that it fulfils; storage, preparation, cooking, service through to dishwashing. When considering these differing aspects of the catering function with a view to energy efficiency, one of, if not the main area one is drawn to is that of prime cooking. This element takes a prepared cold product and by various means heats it to result in a product ready to serve, therefore by its very nature it is easy to see that there must be a substantial energy input.

Is this energy input always provided in the most efficient way?

At first glance one would be excused for believing the only option is to pass the problem back to the equipment manufacturers to improve the efficiency of their equipment, the equipment and plant used within the industry in a large number of cases is only 50% efficient while the domestic market has to achieve 86%; whilst this is an option that is actively being pursued by the manufacturing fraternity it is not the only way forward.

The old adage remains true today and can be very effective in energy savings; "turn it down, turn it off" also a good PPM can help. But there is also another approach if one is prepared to "look outside the box".

A typical kitchen operated within the public sector to provide three meals a day for two hundred people over a one hour service period for each meal, is entitled to the following prime cooking equipment.

- One Gas Bratt Pan
- Two Gas Deep Fat Fryers
- One Electric Filter Unit
- One Gas Salamander
- One Electric Six Grid Combination Oven
- One Electric Ten Grid Combination Oven
- One Gas Open Top Range
- One Gas Solid Top Range
- One Electric Pressure Steamer
- One Electric Tilting Kettle

The energy required to power this equipment is 69Kw's of electricity and 173Kw's of natural gas and on average it will have an hourly usage of 43Kw's of electricity and 108Kw's of gas giving a daily usage for electricity of 339Kw's and 858Kw's of gas.

In addition to the energy used for cooking we need to extract 3.72m³/sec of air and bring in 3.16m³/sec of supply air, this will require 19Kw's of power everyday to power the fans and on average 143Kw's of heat generated from natural gas to power the heater battery to temper the incoming air (this will be much higher in winter and very much lower in summer).

This means that in total the cooking operation is consuming 358Kw's of electricity and 1,001Kw's of natural gas per day to provide 600 meals; therefore the energy used per meal is 2.27Kw's with an emission of 0.592Kg/CO² per meal.

The energy cost to run this operation is between £51.93 and £42.30 per day depending on the energy supplier used and the tariffs offered.

If we are to assume that the above facility has reached the end of its working life and is being refurbished, we can either proceed as in the past by issuing procurement with a specification for the listed equipment or we can take the opportunity to review the requirements and involve all the stakeholders and start afresh.

Very often the driver when purchasing is a low capital cost with little or no consideration being given to the whole life-cycle costs which include energy consumption, labour, the related costs for any necessary consumables like cooking oil and detergents etc.

However the stakeholders will probably include some or all of the following, the client, the end consumer, marketing, operations, health & safety, planning authorities, local residents, engineering, suppliers, waste management, finance, procurement, the designers etc. The various stakeholders will each have their own requirements of the facility ranging from financial, legislation, operation, reputation and increasingly energy, environmental and social. Once all of their requirements have been collated, they need to be turned into a schedule of requirement against which a list of possible alternatives can be prepared.

Where there are a number of different alternatives they need to be life-cycle costed, to achieve this, the preheat energy, idle energy rate, heavy load energy efficiency percentage together with the production capacity need to be calculated. In addition the operating hours per day, working days per year, with the number of preheats each day and the amount of food to be cooked also needs to be calculated. The energy and water costs need to be added together with the lifespan in years.

From this can be obtained the total cost of the utilities to run the appliance for its full life span, this then needs to be supplemented by adding further information which will give labour, consumables, maintenance and disposal costs. Then a valued judgement can be made as to which is the correct appliance or item to specify. A detailed specification to take to the market place can now be prepared.

It is possible, whilst satisfying the requirements of all those involved to provide a facility that has a different look to the original line up with a reduced equipment content, and a revised mixture of gas to electric ratio. This will provide energy savings and reduced carbon emissions.

The revised prime cooking equipment required to provide the three meals a day for two hundred people over a one hour service period for each meal is as follows.

- One Gas Bratt Pan
- Two New High Efficiency Gas Fryers
- Two New Generation Gas Combination Ovens (6 grid)
- Two New Generation Gas Combination Ovens (10 grid)
- One Gas Open Top Boiling Table
- One Gas Tilting Kettle.

The energy required to power the equipment is 2.57Kw's of electricity and 182.3Kw's of natural gas and on average it will have an hourly usage of 1.59Kw's of electricity and 113.03Kw's of gas giving a daily usage for electricity of 12.72Kw's and 904.24Kw's of gas.

In addition to the energy used for cooking we need to extract 2.84m³/sec of air and bring in 2.41m³/sec of supply air, this will require 15.92Kw's of power everyday to power the fans and on average 136Kw's of heat generated from natural gas to power the heater battery to temper the incoming air (this will be much higher in winter and very much lower in summer).

This means that in total the cooking operation is consuming 28.64Kw's of electricity and 1,040.55Kw's of natural gas per day to provide 600 meals; therefore the energy used per meal is 1.78Kw's with an emission of 0.351Kg/CO² per meal.

This shows a saving of 21.3% in energy and a saving of 40.6% in carbon emissions.

The energy cost to run this operation is between £31.43 and £25.75 per day depending on the energy supplier used and the tariffs offered.

This shows a saving of between £20.50 and £16.55 per day which represents a saving of 39.1%.

Due to the new type and style of equipment, when compared to the original, there would be an increase in capital cost to provide this revised option which would be in the order of £1,302.50 which represents 2.5%.

However, even by using the lower saving of £16.55 per day this would show that the pay back period could be as little as 79 working days.

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