MICROWAVE TECHNOLOGIES ASSOCIATION

HIGHLIGHTS

Summer 2021, Issue 109 Newsletter for the MICROWAVE TECHNOLOGIES ASSOCIATION

From our Chairman:

Whilst carrying out the research for this newsletter – Greg and I have been looking at consumer attitudes towards microwave ovens and as you can read from his excellent article opposite, ovens and attitudes have changes drastically since the 1980's when they became common place in kitchens throughout the world.

Indeed, had they been launched on to the market today, they would be hailed as a fantastic 21st century invention; eco-friendly, efficient and a nutritious way to cook food quickly within a small space. With almost 95% of UK consumers having at least one microwave oven in their homes today and our own lack of education out there encouraging every-one to make better use of their ovens to actually cook meals in them, instead of using them to just re-heat and defrost the occasional ready meal, a lot of apathy has set in, especially during the recent lockdowns, when it really didn't' matter if it took 2 hours to cook a meal in the evening – as what else would folks be doing any way?

One of the reasons why 'cheaper' models have seen a significant rise in sales over the past few years, is in fact a lack of education and understanding about their use. I know this by the volume of emails to the MTA's website I still receive, asking me who is at fault – the oven manufacturer or the ready meal manufacturer – when their ready meal doesn't defrost / cook in the time stated on the pack. Or why the inner components cease to work after just 12 weeks. 'You, pay's your money and takes your choice is always my answer'!

Another reason why I am happy that the 'right to repair' law is coming into place in the near future – they will be repairable. No doubt, they will cost more to buy – initially, but better for the world in the long term.

We must continue to be optimistic about our future – good quality microwave ovens are here to stay!

Jennipher Marshall-Jenkinson

Microwave Food Market Report

I was recently made aware of this report and thought it might be useful to MTA members. Please note this isn't endorsed by the MTA and the report hasn't been purchased (it's not free), but still considered it worthwhile in sharing. The following wording came with the report information:

COVID-19 is an incomparable global public health emergency that has affected almost every industry, and the long-term effects are projected to impact the industry growth during the forecast period. The report delivers insights on COVID-19 considering the changes in consumer behavior and demand, purchasing patterns, re-routing of the supply chain, dynamics of current market forces, and the significant interventions of governments. The updated study provides insights, analysis, estimations, and forecasts, considering the COVID-19 impact on the market.

For further information see here:
Microwavable Food Market Research Report - Global Forecast to 2026 - Cumulative Impact of COVID-19

Microwave Adaptations Over the Years

One question that is often posed when companies are developing microwave products is 'what ratings should be used in on-pack instruction guidance'. The power of domestic microwave ovens has increased from about 500W in the 1980's to over 1000W now and instructions should always be based on a range of microwave powers e.g. 700W, 800W & 900W. This led to thinking about the changes microwave ovens have gone through over the years….

Build Quality

When I first started 'working' with food market domestic microwave ovens over thirty years ago, most were microwave only and cost as much as other household 'white goods' such as cookers, fridges and washing machines. They were very well made too, with heavy duty components and excellent cooling systems. Indeed, in the lab where I work many models purchased for some research work back in the late 1980's are still in regular use today. At the cheaper end of the market microwave ovens have drastically reduced in price and a quick internet search reveals some models available now for about £30!

Some cheaper microwave models have been purchased to compliment the wide range used for product development and testing and some issues were quite quickly identified with their performance in 'continuous' use. I know of an old (1980's) Philips domestic non-turntable microwave oven that calibrates at approximately 750W, this oven produces this same output (within a few Watts) even if operated for several hours at a time. This can be compared with some of the very cheapest microwave ovens purchased recently where the thermostat actually cut out microwave power during cooking of a frozen ready meal. There was no indication that the power had cut – the turntable continued to rotate, the timer counting down etc. After a few minutes power was reapplied and the product continued cooking. This pattern happened a few times during the microwave cooking process, and, after following the on-pack cooking time the product was still far too cold to be palatable.

Microwave appliances have seemed to have come full rotation in terms of repairability. Early ovens could easily be taken apart and repaired by competent engineers (and finding one wasn't difficult). But they are more recently considered 'throwaway items' and even getting them apart can be impossible, and even if they could be taken apart, finding a microwave engineer to fix them can be difficult. But at least with the new 'Right to Repair' law coming into force this summer getting microwave ovens fixed should be possible.

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Microwave Adaptations Over the Years (continued)

Turntable or Non-turntable?

Early microwave models tended to be non-turntable in design, this can have benefits with allowing a fully sealed base, meaning spilt liquids can easily be cleaned up and prevents the ingress of liquid and steam into the area between the cavity base and shell. Given that rust leads to the demise of many microwave ovens this feature can help prolong the life of microwave ovens. It's worth noting that almost all commercial microwave ovens, from those earlier ovens to the ones made today are non-turntable in design.

The turntable does perform an important role in allowing more even heating of foods. This works in at least two ways – firstly it moves the food in a circular motion through the (uneven) microwave field, thus helping to even out hot and cold spots and secondly, the moving food changes microwave 'reflections' helping to modify the microwave field pattern, again helping to even out the hot and cold spots. Non- turntable microwave ovens also need a method of 'evening out hot and cold spots', this is usually achieved using a 'mode stirrer'. This is a metal 'fan', often located out of sight behind a plastic shield. This effectively changes the microwave frequency and wavelength by a very small amount as it rotates and as the wavelength changes this modifies field pattern and hence the location of hot and cold spots, giving more even heating. More expensive microwave ovens use an electric motor to turn the mode stirrer, but some of the earlier non-turn table microwave ovens at the cheaper end of the ranges used the moving air from the magnetron cooling fan to blow the mode stirrer around (and very effective it was too – I still have one of these ovens in full working order).

Multiple Microwave Feed Locations

There have been many other design changes attempted to make microwave ovens heat foods more evenly. For example: the use of two different microwave feed locations. Some versions of this design simply split the output from a single magnetron into two waveguides coming into the microwave cavity from two different locations. The thinking behind this was to multiply the number the high and low energy microwave field locations (hot and cold spots), so giving more even heating. Another approach, still used today with catering microwave ovens, was to use two different microwave producing magnetrons, again with different feed locations into the oven cavity. This also has the advantage of doubling the power output of the microwave oven (compared to using a single magnetron). One disadvantage of this is that the electrical power required can be greater than that supplied by a standard 13-amp household socket – so these ovens with powers of several kilowatts need electrical connections more usually found in commercial locations. But given there is no need for microwave of several kilowatts output in a domestic situation, this isn't really a problem!

Microwave Power Generation

In most microwave ovens the energy is generated using a magnetron. This is an efficient converter of high voltage electrical energy into microwave energy that can be used to heat foods (amongst other things!). Traditionally, the high voltage electrical energy used to power the magnetron was generated using a transformer and capacitor combination. This has some disadvantages, such a heavy weight and limited the microwave power output to a single power (lower power levels are achieved by pulsing the energy off and on). This issue with weight and single power output was solved more recently using electrical 'Inverter' technology. This is now common in many microwave ovens and allows different continuous power levels without having to rely on pulsing the magnetron on and off.

In further development now (with a few models available on the open market) are microwave ovens using solid state technology. These do not use magnetrons to generate the microwave energy and do not require high voltage power sources. They are semi-conductor based and are similar to the transmitters used in mobile phones (but far more powerful). These are currently very expensive, but prices will come down as technology advances. Multiple microwave semiconductor generators can be located in a microwave oven, this has the advantage of 'multiple microwave feed locations' giving more even heating than achievable with a single microwave generating magnetron-based oven. The required power can be achieved by using the appropriate number of solid state microwave generators.

Forthcoming Events

IMPI Fall Seminar 19th to 21st October 2021
Protein Innovation Center (Chicago, IL)
Hybrid Event, hosted by IMPI, sponsored by the Middleby Corporation
See: https://impi.org/events/fall-seminar/

Range of Courses at Campden BRI. Online & Onsite, example:

- Developing products with nutrition, health and other marketing claims (online) – 16th September 2021
- Safe cooking: process validation (online) – 30th September 2021
- New Product Development - an overview, (online - two mornings) – 5th & 6th October 2021

See: www.campdenbri.co.uk/training/dates.php

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