Microwave Oven Quality Control
Measuring Power Output

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Periodic monitoring of lab microwave power output is a good idea for many reasons, among them assurance of consistency and repeatability, internal quality control, and compliance with laboratory accreditation programs such as that administered by the College of American Pathologists ("CAP"). Some microwaves, like EBS' H2850, feature a built-in output power test, but many others do not. The following procedure is appropriate for all microwaves, including those with built-in output testing, "power only" microwaves and those featuring a temperature probe.

Materials and Equipment:

- Microwave-transparent container sufficient to hold 1 liter. ("Microwave transparent" means the container must allow microwave energy to pass through without the container heating up significantly. It need not be optically transparent.) Choice of container does matter: round is better, and the depth of the water should approximate the width of the container. A narrow, deep container may skew results low; a shallow, wide container may skew results high.
- 1L graduated cylinder
- Room-temperature water (1L for each test)
- Non-slip thermal mitts
- Thermometer of known accuracy
- Logbook

Safety:

Do not microwave a closed container; pressure buildup is hazardous and may cause container failure. To prevent injury, use thermal mitts when handling the container after heating.

Procedure:

The procedure to measure microwave output is fairly straightforward. If testing a microwave that features a temperature probe, run the microwave in "power only" mode, and either use the temperature probe for temperature readout, or perform manual measurement using a handheld thermometer of known accuracy. (Do not microwave a thermometer!)

1. Measure 1 liter of water in graduated cylinder, and place in microwave-transparent container.
2. Measure the start temperature (degrees C).
3. If the microwave features a "global" output power limit (like in the H2850 "Setup" screen, where the factory default is set at 80%), it must be set to 100%; remember to change it back after testing. Also, do not use air agitation if so equipped; it will skew results artificially low.
4. Place the water into the center of the microwave chamber, and microwave at 100% power for 2 minutes.
5. Quickly measure the water final temperature. (Safety first! Use thermal mitts to prevent burns. Delays in measurement can cause erroneously low readings.)
6. Subtract the start temperature from the final temperature.
7. Multiply the difference by 35. The product is the wattage output.
8. Log results.

We recommend this be repeated a few times, and all results averaged and logged.

Results:

Average microwave power output may vary as much as 20% from the peak power rating on the microwave label. This may be due to several factors, among them line voltage, other equipment on the same circuit (avoid this!), equipment age, and measurement errors inherent in the test itself. Bear in mind: every degree in measurement error translates to 35 Watts! Our experience has shown that magnetrons are typically very stable and long-lived. Excessive deviations in power output may be symptomatic of changes in the magnetron and are cause for further investigation, however.

References:

Login GR, Dvorak AM: The Microwave Tool Book. Beth Israel Hospital, 61-63 (1994)

Thanks to Donna Willis, Harris Methodist Hospital, Fort Worth, Texas

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