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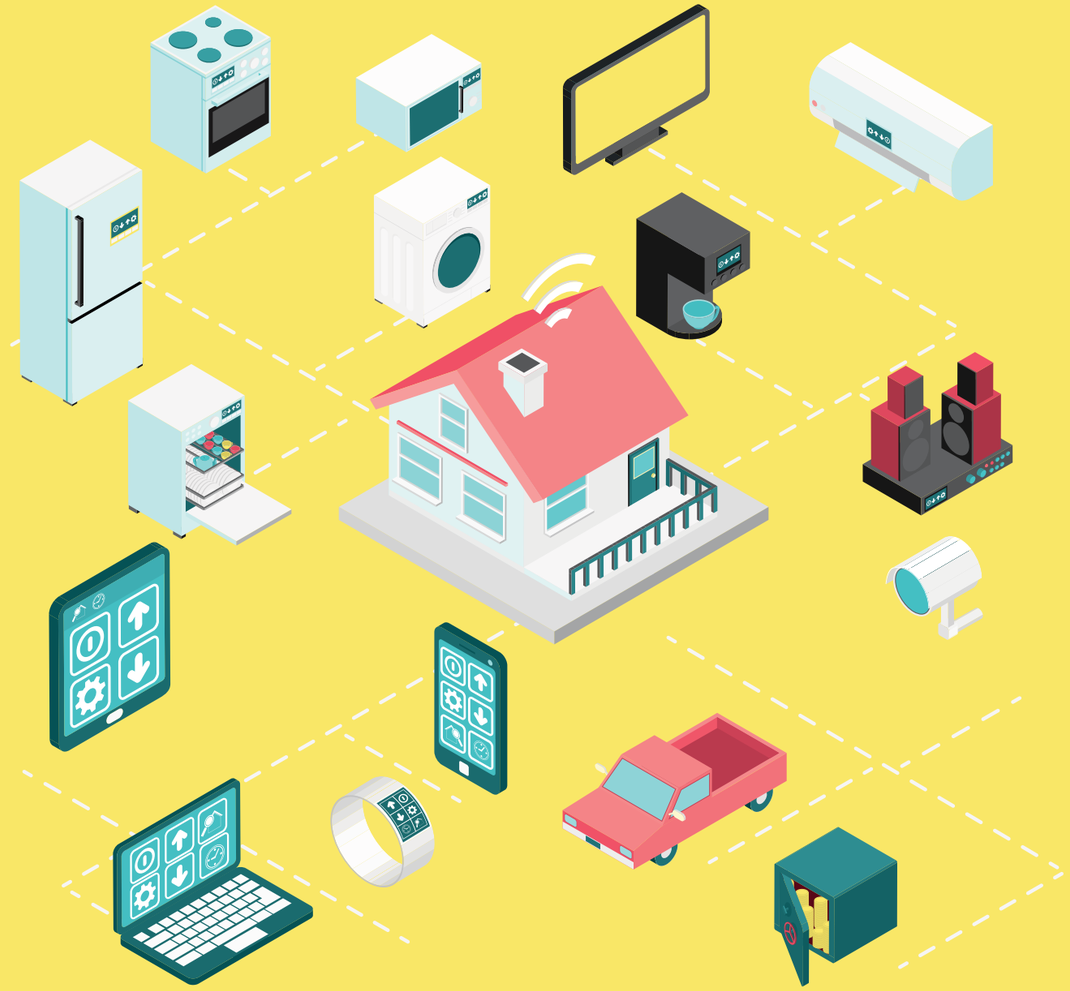

FED TECH

DOMESTIC CENTRAL HEATING AND HOT WATER SYSTEMS IN PRACTICAL HALOCHOH

SUPER-EFFICIENT AND ECONOMIC, BUT CAN THEY BE USED ON YOM TOV?

RABBI YISROEL MOSHE GUTTENTAG
AND RABBI GAVRIEL TATZ

FED TECH HEATING AND HOT WATER SYSTEMS

RABBI YISROEL MOSHE GUTTENTAG
RABBINIC DIRECTOR OF FEDTECH

RABBI GAVRIEL TATZ
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STEVE MERRY
INTERGAS

BENZI MARGULIES
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Can I use hot water from my boiler to wash the dishes on *yom tov*? Can I turn the radiators up or down on Shabbos?

Answering questions such as these demands a thorough understanding of the principles behind domestic heating systems, both the older systems as well as contemporary ones.

More commonly to be found welding pipes or installing a radiator, on a cold December night, Benzi Margulies of BeeXpress Plumbing met with FedTech's Rabbi Yisroel Moshe Guttentag and Rabbi Gavriel Tatz of Edgware Kollel, to provide them with an insight into the workings of common domestic boilers. The discussions on that occasion carried on late into the night, but the meetings and research didn't end there. A long call with Steve Merry - an expert technician from Intergas, a boiler manufacturer - and a brilliantly argued *halachic* piece from the *rabbonim* of the Institute for Science and Halochoh in Bayit V'gan, Israel, have all contributed to the *halachic* intrigue that forms part of this fascinating investigation.

THE OLD SYSTEM

We begin with an analysis of the systems which, up until fairly recently, were traditionally fitted in British homes. A large bulky cylinder would take up space somewhere in the house, and it was here that water for the hot taps was heated and stored.

Although the hot water might be ready and waiting for use if the system has been pre-set to be heating, actually removing the water by turning on the taps carries with it two serious *halachic* questions. First, as hot water flows from the cylinder, it is replaced with a supply of cold water. This water is immediately heated upon contact with the hot water which has been heated in advance, and on Shabbos this activity carries the problematic status of an act of *bishul*. A second concern is that the presence of new cold water in the cylinder will be noted by the device's thermostat, which, in order to compensate for lost heat, will trigger the boiler's heating cycle - an act of *mavir* - lighting a fire. On Shabbos, these insurmountable obstacles mean that one may not draw hot water from the general hot water tap.

On *yom tov*, however, cooking is permitted if it is being performed for legitimate *yom tov* purposes. But whereas cooking may be permitted on *yom tov*, lighting a new fire is not. So how is introducing cold water to the cylinder permitted - surely this will trigger the boiler's heating cycle?

An understanding of the construction of the cylinder is important at this stage. The cylinder contains a large amount of water but is there a need to be constantly heating all of that water? With careful calibration, manufacturers are able to balance the needs for a ready supply of hot water, with the desire to minimise the amounts of energy needed to heat up the large body of water.

Cold water is supplied to the cylinder at its base, and using the familiar laws of physics the hot water rises as it is heated, and slowly climbs to the top of the cylinder, from where it is piped out to the hot water tap.

The thermostat's position is critical. As the cold water remains at the bottom, positioning it too low would mean that the device is never satisfied that enough hot water has been prepared. But if installed too high the device would switch it off when a small supply of hot water is available. Manufacturers assure a steady supply of hot water by positioning the thermostat a third of the way up the cylinder.

These points of technical design are of great interest to us *halachically*. Were the heating cycle to be triggered immediately after removing cold water, releasing hot water from the tap would be problematic even on *yom tov* - as it would be tantamount to lighting a new fire. However, the thermostat's position in cylinder boilers guarantees that any ignition of the boiler fires takes place only after a significant delay - this is deemed to be *gram havoroh* - indirectly triggered ignition - and is permitted on *yom tov*.

CAN HOT WATER FROM THE COMBI BE USED ON YOM TOV?

Whereas hot water cylinders were once a standard feature in our homes, an increasing number of householders have chosen to do away with the bulky traditional system in favour of machines which are both space-saving and offer greater energy efficiency. How do these systems work, and must their installation really spell the end of *yom tov* usage?

Though it is widely accepted that these machines are not compatible with the *halochos* of *yom tov*, some question whether the hot water can be used when the gas fire is already burning. Others have wondered whether some of the functions advertised in the appliance's specification sheets could be brought into commission for use on *yom tov*. To shed some light on these questions, we will study what takes places when we turn on the hot water tap.

SO HOW DOES THE COMBI BOILER WORK?

It might all happen quietly and away from prying eyes, but beneath the surface, a world of activity takes place when you turn on the hot water tap.

The story begins with a carefully regulated mixture of gas and air. This potent recipe becomes the fuel's powerful flames, which swiftly heat the water contained in the primary heat exchanger. The heated water is the perfect vehicle for carrying the concentrated heat of the gas flames safely through our houses and it is pumped around the house to heat our radiators.

But before the water can make it out to the radiators, it must pass through a diverter valve. This diverter is charged with controlling whether to heat the radiators or to provide hot water for washing. Where does the hot water that flows from the taps come from?

The hot water heated in the primary heat exchanger is itself contaminated and not fit for drinking. Instead, its heat is harnessed to provide hot water for washing up and showers.

Here is where the secondary heat exchanger comes into play. The water we receive from the tap must flow past a set of intricately twisted piping which carries the contaminated but scalding hot water from the primary heat exchanger. A safe and hygienic supply of hot water is the result.

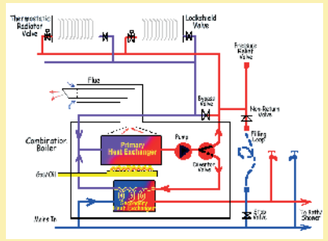
Clearly forbidden on Shabbos due to the prohibition against cooking, it is not yet apparent what the pitfalls of using hot water on *yom tov* are. Surely, heating water is in itself permitted? Here is where Benzi's invaluable understanding comes into play.

WHAT PROCESSES ARE TRIGGERED WHEN I TURN ON THE HOT TAP?

Turning on the hot tap causes a flow of water, which is detected by a sensor, which in turn relays this information to a small computer. Moving into high gear, the boiler reacts to this new request for water in three distinct ways.

THE COMBI BOILER HAS THE FOLLOWING KEY COMPONENTS:

- GAS VALVE
- FAN
- GAS BURNER
- MAIN HEAT EXCHANGER (HE)
- SECONDARY HEAT EXCHANGER
- PUMP
- DIVERTER



THE PLUMBER'S HALACHIC CHALLENGE: CAN A BOILER WITH A CYLINDER BE CONFIGURED FOR SHABBOS USE?

Using the hot water from a cylinder boiler is theoretically possible even on Shabbos. But to do so, before Shabbos, the cold water inlet which supplies cold water to be heated in the cylinder needs to be closed. This would mean that releasing hot water from the taps for use would not introduce new cold water to the system. In a megaflow system, this may be possible to achieve. In a traditional vented system, a pipe leads from the cylinder to the loft from where atmospheric air is introduced to the system to prevent dangerously high pressure levels, the householder may not have considered the presence of cold water in this vent pipe. On releasing hot water from the tap, this cold water will eventually return to the boiler, and quite possibly be heated on Shabbos.

Other ingenious methods have been suggested and in some cases used. Hot water is cooked on Shabbos when it meets previously heated water in the location in which it was originally heated. Moved to a new utensil it is now *kli sheni* - this water cannot *halachically* cook. So why not transfer all the water to a second cylinder - and only introduce the cold water to the secondary cylinder. Wondering why we don't all install a *kli sheni* tank? The challenges, both technical and *halachic*, are somewhat of a nightmare.

And then you could always try to set a thermostat in the cylinder which will regulate the heating of the water - ensuring that at no point will the water's temperature ever reach above the level of *yad soledes bo* - the temperature which *halochoh* views as capable of cooking other foods (generally assumed to be 45 degrees). But even this approach carries questions - maybe somewhere in the cylinder the water *will* cook to above the permitted levels? Even if we can resolve the issues of *bishul*, how do we avoid the questions of *mavir* - igniting a fire on Shabbos? Of course, professional advice would also need to be sought to ensure no risk of Legionnaire's Disease.

Before considering the installation of any such system, ensure to consult a *frum* technician and your local *rov*!

CAN THE SETTING ON MY CENTRALLY HEATED RADIATOR BE CHANGED ON SHABBOS?

Raising the temperature setting on a radiator's valve is forbidden on Shabbos. There are two reasons for this: 1) the cold water in the radiator will be heated by the influx of newly supplied hot water 2) the cold water in the radiator will be pushed back towards the boiler where it will be heated once again.

If the room is too hot and you would like to close the radiator valve, this would be permitted on Shabbos as your act is simply ensuring that no new water will be passed into the radiator.

If you have replaced your radiator valves with smart Honeywell Evohome technology, you will find that the radiator's valve senses when a window nearby has been opened, and instructs the radiator to shut its valve. These smart sensors are problematic and should be shut off before Shabbos.

DIVERTER VALVE Having registered that hot water is required, the system realises that to fill this request as quickly as possible it must concentrate on heating the water for the tap. To do this, it instructs the diverter valve to divert the flow of hot water away from the central heating and its radiators and towards the secondary heat exchanger where it will heat the tap water.

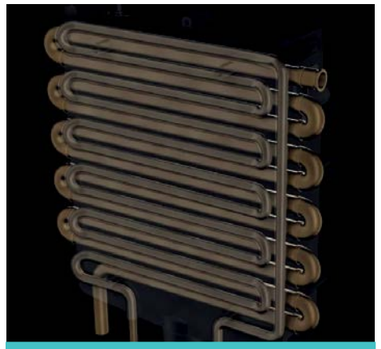
GAS FLAME Producing hot water for the taps requires a stronger flame than for central heating. Even if the system was previously active, with gas flames burning to provide hot water for the central heating, the flow will need to be increased to supply the energy necessary for heating the large amounts of cold mains water. Though on *yom tov* one may *manually* raise the flame on one's gas stove, it is forbidden in this case due to the electronic activity involved.

PUMP The water is transported from the primary heat exchanger to the secondary heat exchanger by means of a pump. Calling for hot water may activate this pump.

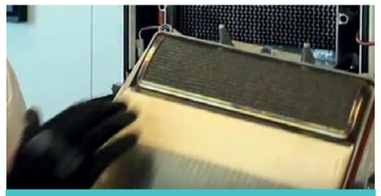
SO IS INTERGAS ANY DIFFERENT?

Having clearly demonstrated the prohibited nature of a request for hot water from a combi boiler due to the myriad electronic functions triggered, it is time to query whether the Intergas boiler is any different. Not satisfied with a general prohibition against the use of combis on *yom tov*, some enterprising members of the community have highlighted the different operating approach adopted by the Intergas combi boiler, and they have questioned whether these boilers would meet the requirements for *yom tov* use.

We turn to our conversation with Steve Merry of Intergas. Steve explained that the defining characteristic of the Intergas boiler is its deployment of a single heat exchanger. In their appliance, two sets of piping run simultaneously through the same heat exchanger. In their literature, they are keen to point out that their device has only four moving parts. Removing the need to pump water to the secondary exchanger, neither a pump nor a diverter valve are necessary for providing hot water, and two of the *yom tov* issues have easily been neutralised.



INTERGAS'S TWO SEPARATE NETWORKS OF PIPES - HEATED SIMULTANEOUSLY; NO NEED FOR A SECONDARY HEAT EXCHANGE



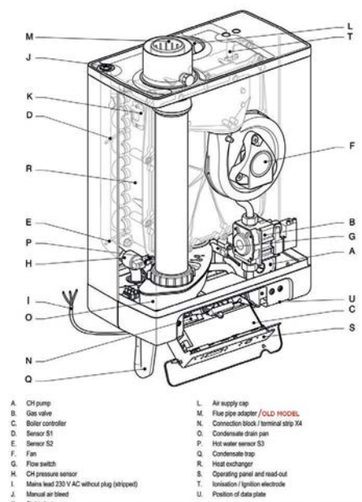
SERVICING AN INTERGAS BOILER

Yet, even the use of this device presents *yom tov* challenges. Of primary concern is the electronic control of the gas flame. But equally important is the operation of the pump. Though not needed to provide the hot water, a pump is necessary to drive the flow of hot water around the central heating system. Were one to request hot water while the central heating was on, this pump would be deactivated by the computer to allow the heat from the flame to be focused solely on the provision of hot water for the shower.

CAN THE INTERGAS BOILER BE CONFIGURED FOR YOM TOV USE?

Although when operating in standard mode, calling for hot water deactivates the central heating pump, Steve explained that the system can be set to maintain continuous operation of the pump. This solves the problem of the interaction with the appliance's pump, leaving the prohibited action of electronically interfering with the gas flame.

Some with a keen technical understanding have noticed 'comfort mode', an optional setting available on many combi boilers, and have questioned the possibilities for its use on *yom tov*.



INTERGAS COMBI BOILER PART LIST

Opting for the luxury of hot water available immediately on demand, the user will set the appliance to a 'pre-heat'. In this setting, the boiler will have been constantly kept hot in readiness for when it is required.

Does the fact that the hot water is already present mean that the system will only activate its heating once the supply of hot water has been exhausted? If this were to be the case, could this feature allow the appliance to be used on *yom tov* just like the traditional boilers whose heating is activated at a significantly delayed stage?

Steve explained to us that the comfort feature is not unique to Intergas and is common across the full spectrum of combi boilers. and that electronic activity is indeed triggered immediately even when operating in comfort mode.

CLOSING THE DOOR ON THE YOM TOV COMBI?

The reader may not have considered a further point which Benzi raises in this connection. Besides for the issues involved when turning on the tap, when the dishes have all been washed, turning off the tap carries with it additional questions. Beyond the accompanying electronic activity which will turn off the pump and close the diverter valve, one needs to consider the questions surrounding forbidden *kibuy* - 'extinguishing' - on *yom tov*. Though it is often permitted to increase a pre-existing flame on *yom tov*, reducing or extinguishing is only very rarely permitted.

With this final argument, the case for the use of hot water from the combi boiler is put to rest. To allow for the use of hot water from combi boilers, a radical and new configuration would be required. Having streamlined their models and removed problematic pumps and valves, the Intergas device would seem to be the closest, but it would take a new generation of software development to truly address the substantive *halachic* concerns. ■

SHAILATEXT

We are replacing our boiler after many years. My plumber has recommended that we have a 'megaflow' system installed. Will it be possible to use hot water from this on *yom tov*?

A hot water system can be used if the water is heated and stored in a cylinder. The word 'megaflow' is a trade name, much like Hoover is for vacuum cleaners. A megaflow is simply a pressurised system which heats and stores water in a cylinder. *Yom tov* use of such systems is permitted when water is needed for legitimate *yom tov* causes such as washing dishes.

NEED TO BUY A NEW APPLIANCE? NEED GUIDANCE ON USE OF YOUR OVEN DURING YOM TOV?

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