Two inventors came up with an interesting product that they called “Joulies” (pronounced “Joo-lees”). Each Joulie looks like a 2 inch-long stainless steel coffee bean and is filled with a proprietary material. The material inside the Joulie is designed to absorb heat that is more than 140° F and then release that heat when the surrounding area cools below 140° F. Consumers are supposed to put Joulies into their coffee mugs so that the Joulies will quickly cool the coffee to a drinkable temperature; then as the coffee cools the “magic beans” release their heat and thereby maintain the temperature of the coffee. This article will address a number of questions (kashrus, Shabbos, and others) that are raised by this product. We will start with a more detailed description of the product.

**PCM**

The company is understandably secretive about what the Joulies are filled with, but we were able to come up with an educated guess as to what the material is. We based this on (a) the pieces of information they provided, (b) review of scientific literature on the topic, and (c) physical and chemical analysis of the material, as follows.

The company website and literature note that Joulies are, “filled with a proprietary substance called a ‘Phase Change Material’ (PCM) that melts at 140°F and is 100% edible food-grade magic.” The company also told me (via email) that “the PCM inside is made from plants”.

We purchased a set of Joulies and had one cut open revealing that the PCM is a white, waxy, somewhat-grainy material. When the (open) Joulie was put into boiling hot water, the PCM began to melt and the liquid floated to the top of the water. [After the water cooled, the liquid solidified.]

The following is a helpful definition of the term “Phase Change Material”:

PCM materials have high heats of fusion so they can absorb a lot of energy before melting or solidifying. A PCM temperature remains constant during the phase change, which is useful for keeping the subject at a uniform temperature.\(^1\)

In other words, a PCM is a type of material which requires a relatively large amount of energy to convert it from a solid state/phase to a liquid state/phase (i.e. high heat of fusion) such that the material absorbs heat/energy as it melts (i.e. as it changes “phases”). Thus the material remains at a constant temperature (its melting point) as it changes from a solid into a liquid. When the surrounding material cools below the PCM’s melting point, the latent heat in the liquid PCM is released back into the surrounding material as the PCM changes back into a solid.

In recent years, a number of papers have been written in scientific journals\(^2\) detailing the dozens of different PCMs available and describing the properties of each. Armed with the knowledge that the PCM used in Joulies has a melt-point of 140° F, is a food-grade material, is claimed to be made of plant materials, and has a solid waxy consistency at room temperature, we reviewed some of those articles to see if we could pinpoint which PCM is inside a Joulie. This investigation showed that the PCM used in Joulies is most likely palmitic acid which has a melting point of 61-64° C (142-147° F) or possibly

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myristic acid (which has a melting point of 49-58°C / 120-136°F). Both of these fatty acids have a relatively high heat of fusion (185-204 kJ/kg), are waxy solids at room temperature, and can be food-grade materials made of plant products. We then had a cRC certified company run the PCM through a Gas Chromatography (GC) Mass Spectrum which confirmed that it is, in fact, palmitic acid.³

Kashrus

Palmitic acid is definitely a kosher-sensitive ingredient, as it is often derived from animal fat⁴ and even when it is derived from plant materials, as the company claims,⁵ the palmitic acid is commonly produced at high temperatures on large equipment which is also used for animal fat. Thus, even if the Joulie PCM is, in fact, “made from plants” it might not be kosher.⁶

There are, however, a few reasons why even if the PCM is not kosher, one might still be permitted to use it in hot kosher beverages.

Firstly, a Jew who tasted the PCM said that it was basically tasteless with a waxy consistency. If so, it would seem that we should be able to apply the ruling of Rema 103:2 that one does not have to be concerned about b’lios from forbidden items which are tasteless.⁷ There are a number of concerns with this line of reasoning:

- It would seem that a decision that the PCM is tasteless should be based on the tastings of multiple people.

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³ The test also showed traces of oleic acid. Oleic acid is not a known PCM and therefore it is most likely that the traces of oleic acid are due to impurities in the palmitic acid rather than an intentional additive.

⁴ Palmitic acid (like most fatty acids) is isolated by splitting fats or oils at very high temperatures (~150-250°F) into two parts – glycerin and fatty acids. The mixture of fatty acids derived from the given fat or oil is then further processed at high temperatures (~150-250°F) to separate, purify, and deodorize them for use. The sophisticated equipment used for these processes is (a) at times used for both animal and vegetable products, (b) often not cleaned between products (since the products do not easily spoil, and the distillation and other purifications remove impurities), and (c) relatively large (such that absorbed non-kosher taste may not be batel b’ishim into subsequent kosher products).

⁵ There may be basis for accepting the company’s claim even as relates to a potential issur d’rabannan based on the principle of mashehu nosein ta’am (see Shach 98:2 and Iggers Moshe YD 1:55).

⁶ If the PCM is plant-based and is only non-kosher due to absorbed non-kosher taste, should we possibly apply the rule of mashehu nosein ta’am (Shulchan Aruch 103:7) and say that the absorbed ta’am cannot transfer into the stainless steel shell since there is no liquid medium between the PCM and shell? This suggestion is incorrect for two reasons: 1) The absorbed non-kosher animal fat is a davar shamen which most hold can transfer from food into a lid without a liquid medium (see Badei HaShulchan 105:112), and 2) when the Joulie is put into hot water the PCM changes into a liquid!

⁷ This line of reasoning was suggested by R’ Eli Leibenstein. See Avreich HaShulchan 103:19 and Pri Megadim SD 103:2 who explain why the case of tasteless food is different than the case of Shach 103:2 of food which is nosein ta’am but the ta’am does not contribute positive (or negative) taste into the kasher food.

If this line of reasoning is legitimate, it would seem that one could even l’chatchilah put the Joulie into hot coffee and it would not be considered bitul issur d’rabannan ta’am. But (a) in this case where no one will eat even a drop of the forbidden PCM, and there is no ta’am transferring into the coffee, it is not clear that this even qualifies as bitul ta’am at all since the person is not putting issur into the heter, (b) there are cases that hold that the issur d’rabannan of bitul ta’am l’chatchilah does not apply to safek issur (see Badei HaShulchan 99:29), and (c) this case may well qualify as l’havin min yachid where bitul ta’am l’chatchilah does not apply.

- Whether other Jews are permitted to taste the safek issur and whether the permitted level of tasting is sufficient to determine that the food is tasteless is discussed in Taz 98:2, Pri Megadim ad loc, and Yad Yehuda 98:2. On the other hand, it may be sufficient that the gut reaction of all those who saw and touched the PCM was that it would be tasteless, and this may not be much different than Rema ibid. who assumed that bee legs are tasteless even though we can only imagine that he never actually tasted them.

- Scientific reference works⁹ indicate that palmitic acid has almost no “taste” but does provide some element of mouthfeel. Seemingly, mouthfeel qualifies as “ta’am” even if scientifically it may not be considered “taste”, which would imply that these items are not “tasteless”. On the other hand, it may well be that the subtleties detected by flavor chemists may be too insignificant to qualify as “ta’am” for the average person.

- Toras Chattas (Rema), Shach and others say that nowadays one may not rely on a Jew’s tasting of a food to determine that it does not have a taste of meat so as to then l’chatchilah mix it with dairy; rather, “tasting” (even by a Jew) is only relied upon for cases of b’dieved.⁹ The reasons¹⁰ given for this chumrah would appear to also apply to determining that a food is tasteless. Does this mean that one may not l’chatchilah use Joulies in hot beverages even if multiple Jews and scientific publications would inform us that the PCM is tasteless?

- On the other hand, it may be that our case is somewhat more lenient due to the fact that (a) the PCM is only safek issur, (b) no one will ever eat the PCM but rather our concern is that it is nosein ta’am into the beverage, and (c) the only way it can be nosein ta’am if it taste passes through the metal shell, and the ability for ta’am to pass through metal is itself a safek.¹¹
In addition, Joulies are never used in a kli rishon, and the PCM only has contact with hot beverages as a kli sheini. If so, ta’am cannot transfer more than k’dei klipah, which means that ta’am from the PCM cannot transfer through the k’dei-klipah-thick stainless steel shell. Therefore even if the PCM is non-kosher, the status of the hot coffee or other beverage should not be affected by the PCM. [Furthermore, b’dieved one does not have to be concerned about the transfer of ta’am in a kli sheini.] The concerns with this line of reasoning are:

- If a person would ever put his Joulies into the dishwasher – and if a dishwasher has the status of a kli rishon – the (possible) non-kosher taste of the PCM would be fully absorbed into the stainless steel shell such that it could subsequently be released even with an irui kli rishon.

- On the other hand, it is generally assumed that any b’lios that is extracted via an irui kli rishon (i.e. when coffee is poured over the Joulie) is batel b’shishim into the hot water.

Summary

Joulies are filled with a material known as PCM that may possibly be non-kosher. The reasons to nonetheless consider permitting the use of Joulies in hot kosher beverages are that:

- The PCM is only a safek issue.
- The PCM appears to be tasteless, such that (a) it’s b’lios cannot affect other foods, and (b) any minimal taste may possibly be batel b’shishim (see footnote 11).
- The PCM only has indirect contact with the beverage and it is a safek if (and how much) ta’am can pass through metal.
- The Joulies are only used in a kli sheini, such that (a) b’lios cannot pass through the shell, and (b) b’dieved we are not machmir for kli sheini.

Although there are questions on some of these individual reasons and some only apply b’dieved, it seems that the combination of all of these factors may be enough to permit the use of Joulies in kosher foods. Others will undoubtedly choose to be machmir and not use them due to the kashrus concerns.

Under the assumption that the use of Joulies does not pose a general kashrus concern, we now turn to some other questions that relate to their use.

Other Kashrus Issues

Some of the leniencies noted above do not apply on Pesach, and it therefore seems prudent to be machmir and not use Joulies (even new ones) on Pesach.

It is obvious that one may not use the same Joulie for both meat (e.g. soup) and dairy (e.g. coffee with milk). Furthermore, the custom is that if one owns two of the same item and one is designated for dairy use and the other for meat use, the one designated for dairy use should be “marked” so that it will not mistakenly be used for the wrong use.

Shabbos

The general rule is that the prohibition against cooking on Shabbos does not apply to foods which have already been cooked once before. Foods which are in liquid form are an exception to that principle, because once the food cools down it loses its “cooked” status. Magen Avraham clarifies that as relates to this halacha ambient temperature animal fat has the status of a solid food even though it liquefies as it warms up. He therefore rules that the prohibition against cooking on Shabbos does not apply to animal fat which was cooked before Shabbos. We can apply this same principle to the palmitic acid PCM; it was cooked before Shabbos and is now in solid form such that if one would put a Joulie into hot water there would be no violation of the prohibition against cooking on Shabbos.

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11 For example, b’lios in a kli sheini are forbidden even b’dieved (Rama 447:3 as per Mishnah Berurah 447:25).
12 Rema 894 (end).
13 Shulchan Aruch 318:15 as per Mishnah Berurah 318:92-93 & 95.
15 Magen Avraham 318:40 cited in Mishnah Berurah 318:100.
16 Iggeros Moshe OC 4:74f (in the bishul section) and Shemiras Shabbos K’Hilchos OC 1:58 (as explained there in footnote 173) disagree as to whether Magen Avraham’s leniency applies to butter which is cooked in a liquid form (as milk) and cools (i.e. attains an “un-cooked” status) before it solidifies, in the same way that it applies to animal fat which solidifies (i.e. becomes a solid) as it cools. However, the physical properties of palmitic acid are similar to that of animal fat (both solidify as they cool) and therefore all would agree that Magen Avraham’s ruling applies to PCM.
17 As noted in an earlier footnote, one step in separating fatty acids such as palmitic acid from oils (or fats) is to cook the oil at very high temperatures (~700°F) which obviously qualifies as a “cooking” for that oil.
18 In addition to the reason noted in the text there is no prohibition of bishul in this case because the Joulie is placed into a kli sheini.
However, it would seem that it is forbidden to put use Joulies with hot beverages on Shabbos due to the issur d’rabbanan of nolad, intentionally converting an item from solid to liquid form.\footnote{Rema 318:16 as per Mishnah Berurah 318:105. In our case, it appears that all conditions of nolad (a meaningful amount of liquid which does not immediately become mixed into another food) apply.} We have already seen that this change in form is critical to the Joulie performing its “magic”, and therefore that change is considered intentional and forbidden.

**Tevillas Keilim**

The functional portion of the Joulie is the PCM which is a material that does not require tevillas keilim. However, since the stainless steel shell comes in contact with the food, and the Joulie would clearly not function without the shell, the Joulies must undergo tevillas keilim before they are used, and one should recite a bracha on that tevillah.\footnote{Based on Rema 120:7 (end). Chochmas Adam 73:11 says that this type of case requires tevillah and the fact that he does not say “tevillah without a bracha” (as he does for other cases in that same halacha) implies that a bracha should be recited in this case.}

**Summary**

Joulies are filled with a material known as PCM that may possibly be non-kosher, but there are nonetheless reasons to permit their use in kosher beverages. Separate Joulies should be used for meat and dairy. One may not use Joulies on Shabbos, and it seems appropriate not to use them on Pesach. Before Joulies are used, they should undergo tevillah with a bracha.

**Multiple Matzos Baked as a Single Sheet**

In some machine matzah bakeries, the matzos go through the entire oven as one long sheet. As an introduction to the two halachic issues raised by that practice, we will review some details of how these types of machine matzos are formed and baked. After the dough is kneaded, it is rolled into a long, flat sheet which passes under two sets of blades that score the sheet lengthwise and widthwise. These blades score the sheet into matzah-sized squares but do not cut the dough all the way through; rather, the matzah passes through the oven as a scored sheet, and after it leaves the oven it is broken into individual matzos.

**Shalem**

The most well known issue that this setup raises is that perhaps the individual matzos should not be considered shalem in terms of using them for lechem mishneh. [This issue is relevant year-round and is not specific to Pesach.] How can a single matzah be considered “whole” if it was baked as part of a 300-matzah-long sheet? Although this question seems compelling, most Poskim\footnote{Many of the sources brought to the author’s attention are from the discussion on this topic in She’arim Metzuyanim B’halacha 110:23, available at http://hebrewbooks.org/14619.} hold that the individual matzos are, in fact, considered shalem and they offer three reasons for this position:

1. **Shulchan Anuch**\footnote{Shulchan Anuch 168:3. A similar proof is brought by Minchas Pitim (see below) from the halacha of a double-esrog (amam wamam) cited in Shulchan Anuch 648:20.} rules that if two pieces of dough were stuck together in the oven and were then separated from one another after baking, the individual matzos have the status of being shalem (and the joined matzot do not).\footnote{Rav Mordechai Ephraim Fischel Sofer writing in Minchas Pitim 34 rejoin that (a) Minchas Pitim\footnote{Minchas Pitim (Rav Meir Arik) 274 & 648, available at http://hebrewbooks.org/37527. This also appears to be the opinion of Shotei U’Maishiv li:167 (towards the end), referenced in Da’as Torah 274:1, regarding the use of challos (stuck together during baking) for lechem mishneh.} clearly disagrees with Machatzis HaShekel’s suggestion, and (b) there is reason to think that in our case it is even more obvious that the individual matzos are considered shalem because the joined matzos were specifically scored to begin the separation process (as opposed to the case of Shulchan Anuch/Machatzis HaShekel where the separated matzos were unintentionally joined).} 2

2. **Shulchan Anuch**\footnote{Rav Sofer in Yerushas Plaitah #1, available at http://hebrewbooks.org/37527. Lechem mishneh is broken into individual parts if the original intention is to later break it up. Rav Sofer and Tzur Yaakov\footnote{Tzur Yaakov 151 (Rav Avraham Yaakov Horowitz), available at http://hebrewbooks.org/14619.} suggest that this principle, known as יד א꽁 מחברות עמר נפוץ כדי, can be applied to our case where the matzah is only temporarily maintained as a long sheet and the obvious intention is to break it into individual matzos after the baking.} says that if a loaf of bread is broken in half, a person can join the two pieces together with a toothpick and consider the newly-connected loaf to be a shalem.\footnote{Tzur Yaakov 168:2.}

3. **She’arim Metzuyanim B’halacha**\footnote{She’arim Metzuyanim B’halacha 110:23, available at http://hebrewbooks.org/14619.} hold that the individual matzos are considered shalem because the joined matzot were specifically scored to begin the separation process (as opposed to the case of Shulchan Anuch/Machatzis HaShekel where the separated matzos were unintentionally joined).

Some question these proofs (and particularly the first one) based on Machatzis HaShekel\footnote{Machatzis HaShekel 648:20.} who suggests that these halachos may only apply in cases of b’dieved. However, others\footnote{Rav Mordechai Ephraim Fischel Sofer writing in Minchas Pitim 34 rejoin that (a) Minchas Pitim\footnote{Minchas Pitim (Rav Meir Arik) 274 & 648, available at http://hebrewbooks.org/37527. This also appears to be the opinion of Shotei U’Maishiv li:167 (towards the end), referenced in Da’as Torah 274:1, regarding the use of challos (stuck together during baking) for lechem mishneh.} clearly disagrees with Machatzis HaShekel’s suggestion, and (b) there is reason to think that in our case it is even more obvious that the individual matzos are considered shalem because the joined matzos were specifically scored to begin the separation process (as opposed to the case of Shulchan Anuch/Machatzis HaShekel where the separated matzos were unintentionally joined).} 3 still hold that the individual matzos are considered shalem.

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\footnote{29 Rav Sofer in Yerushas Plaitah #1. [Yerushas Plaitah is a journal printed in Budapest in 1946 which features divrei Torah written (primarily) by Hungarian Rabbinim before WWII; the journal is available at http://hebrewbooks.org/538, and the first four entries are on the topic of machine matzah which are baked in one attached sheet.]}

\footnote{30 Shulchan Anuch 168:2.}
Rav Shteif\(^{36}\) argues that (a) the above principle is the subject of a halachic dispute, and the accepted halacha (at least in this type of case) does not follow this opinion, and (b) although it is clear that the sheet will be broken into individual matzos after it leaves the oven, it is equally clear that in order for the oven to function properly the sheet must remain whole until it leaves the oven such that it is not הכותך (unbroken) until it is already baked.\(^{37}\) [The discussion regarding point “a” is beyond the scope of this document.] Rav Sofer\(^{38}\) replies to point “b” that (c) the scoring of the matzah before it enters the oven sufficiently indicates the intention to eventually divide the sheet, and (d) the oven can function well if there is even a minimal connection\(^{39}\) between the portions of the sheet.

Rav Sofer and Rav Mordechai Meir Bennet\(^{40}\) support their overall lenient positions by citing the “minhag in all of Poland” to purposely bake 12 pieces of dough together (for non-Pesach use) and then use the individual pieces as whole challos rolls for lechem mishneh.

**Heating of the dough**

The fact that the dough enters the oven and is baked as one long sheet raises another question which is particular to Pesach. It is well known that matzah-dough cannot be at all warm (before it is baked), because that might cause it to become chametz in less than 18 minutes. Accordingly Rav Shteif\(^{41}\) wonders if the dough which is not yet in the oven might get hot/warm, because it attached to the dough which is already baking in the oven. In response to this, Rav Sofer and Rav Bennet\(^{42}\) report that their experience showed that the dough shows no sign of heat before it goes into the oven, and they were therefore unconcerned with this issue. Rav Bennet further suggests that even if the dough would be very hot for a few seconds before it gets into the oven that would not be enough time for it to become chametz.\(^{43}\)

The aforementioned Poskim specifically note that their discussion presupposed that the principle of an enable us to make impressions of foods is limited to heat spreading through metal utensils.\(^{44}\) Chazon Nachum\(^{45}\) cites others who agree with that position but then argues that לא אנוutory acid does not apply to foods and is limited to heat spreading through metal utensils.\(^{44}\) Chazon Nachum\(^{45}\) cites others who agree with that position but then argues that לא אנוutory acid does not apply to foods. He therefore supports a Rav in Antwerp who forbade the use of Pesach matzah baked as one long sheet.\(^{46}\) Those illustrious Rabbinom who have permitted the use of multiple matzos baked as a single sheet have apparently adopted the lenient position on this question.

### BUTYL COMPOUNDS

Butyric acid is a carboxylic acid with 4 carbons (and is technically known as butanoic acid), which is most commonly found as a component of (rancid) butter. The following are notes from the June 2008 AKO Ingredient Meeting:

Rabbi Gomish reported that the OK does not consider butyric acid a Group 1, because of a concern that it is produced from grape-based fusel oil. The committee members agreed that butyric acid can be isolated from fusel oil, but argued that the amount of work required to isolate and purify butyric acid from fusel oil made it not commercially viable to do so. Therefore all butyric acid should be assumed to be from synthetic sources.\(^{47}\) Thus, the consensus was that although fusel oil and even isoamyl alcohol are not considered Group 1 because they may be derived from grape-based alcohol, butyric acid and butyl compounds should be Group 1.

Rabbi Gomish accepted these arguments, and on the day after the meeting he reported that Rabbi Don Yoel Levy was amenable to the OK changing its policy on this issue; the butyl compounds could therefore be included on the Group 1 list.

Based on the above, butyl (a.k.a. butanoic) compounds are Group 1 as they are assumed to be synthetic, but the “natural” version of butyric acid or butyl compounds are not Group 1 as they may come from butter or fusel oil.\(^{48}\)

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\(^{36}\) Rav Yonason Shteif writing in Yehudah Paskah #2.

\(^{37}\) Taur Yaakov ibid. makes a similar point (regarding to a leniency he suggests based on the experiment noted in Shuchan Anuch 167:1) but concludes with a proof that the matzah is considered shalem for other reasons, as noted earlier in the text.

\(^{38}\) Yehudah Paskah #3.

\(^{39}\) In fact, in most ovens the dough must merely be attached when it enters the oven (so that the dough that is not yet in the oven will be pulled onto the oven-belt), but once it is on the oven-belt there is no need for the individual matzos to be attached to one another.

\(^{40}\) Yehudah Paskah #1 & #4.

\(^{41}\) Yehudah Paskah #2.

\(^{42}\) Yehudah Paskah #3 & #4.

\(^{43}\) He notes that although Shuchan Anuch 459:2 implies that in such circumstances the chimutz can happen instantly, those words should not be taken literally; it actually takes some time for the dough to become chametz. [See Midrash Berurah 459:18 who makes a similar point.]

\(^{44}\) In other words, they were focusing on whether the dough outside the oven is perceptibly hot and not whether the halacha dictates that we should consider it hot.


\(^{46}\) This also appears to be the conclusion of She'arim Metzuyanim B’halacha 114:10.

\(^{47}\) Additionally, it was noted that (a) Rema 114:10 (as explained by Shach 114:21) holds that in cases such as this, one need not be concerned that the item is produced from stem yasvin and (b) grape-based fusel oil is often used specifically for natural grape flavors, because that fusel oil is believed to carry trace notes that are appropriate for a grape flavor.

\(^{48}\) Some literature indicates that it can also be made via fermenation.
HOT BOX KASHERING

Background

A hot box is an insulated box into which one puts pans or plates of food to either maintain or increase their temperature. Some of them have built-in heating elements, and others are heated by putting “Sternos” onto the floor of the hot box. The boxes range in size from approximately 10,000-90,000 cubic inches and are ubiquitous in banquet hall kitchens where a caterer might use many hot boxes for a given event.

In addition to the traditional uses for a hot box, kosher caterers will sometimes use them as “portable ovens” when they are catering an event at a non-kosher venue. The caterer will cook all food in his kosher commissary, and instead of cleaning and kashering the hotel’s ovens he will use hot boxes to heat up the food at the event.

Since hot boxes are regularly used for the storage of hot food, there is no question that a non-kosher hot box cannot be used unless it is kasher beforehand. The zei’ah (and spillage) escaping from pans of non-kosher food renders the racks, ceiling, and even walls non-kosher. The fact that a heating element transfers into the (previously) non-kosher will transfer into the (previously) non-kosher. The fact that a heating element transfers into the (previously) non-kosher.

However, in recent weeks the OU conducted tests when they were used for non-kosher), and the utensil is not considered “kosher” just because it was heated to a temperature which is hotter than the one used other words, ibid. 451:5), but does not apply to the temperature of the utensil.

OU Ruling

As noted, the aforementioned method of kasher hot boxes is an attempt to create libun kal in place of hag’alah. What temperature is required for libun kal? It is well documented in earlier Poskim that libun kal is accomplished when heat is applied to a surface until the backside side of that surface reaches yad soledes bo (~160-175° F).

Until now, the OU and others assumed that the kasher method outlined above met this standard. However, in recent weeks the OU conducted tests which showed that when people performed the

50 There is a common misconception that the kashering is accomplished via k’bol’oh kach polto, which is to say that if the hot box is only heated via Sternos then it can also be kasher with a similar number of Sternos. The fallacy with this is that it is widely accepted that the concept of k’bol’oh kach polto applies to (a) choosing whether libun or hag’alah is required (Shulchan Aruch 451:5), and (b) the level of hag’alah which is required (ki rishon, ki sheini, exact temperature) (ibid. 451:5), but does not apply to the temperature of ibun. In other words, ibun can only be accomplished when the item reaches a specific objective temperature (regardless of how hot the food and utensil were when they were used for non-kosher), and the utensil is not considered “kasher” just because it was heated to a temperature which is hotter than the one used during cooking of non-kosher food.

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53 See, for example, Section X of the OU’s Commercial and Retail Kashering, authored by Rabbi Yosef Eisen which was printed in 1993 and (essentially) recommended this method of kasher for hot boxes (warming cabinets). One reason why people have thought that the hot boxes met the standard for ibun kal is that many Mashgi’im report that during kashering even the outside of the hot box is exceedingly hot in spite of the fact that the walls are insulated.

54 See questions 25-27 in OU Document X-1 which was written circa 1990.
“kashering procedure” the hot boxes did not necessarily reach and maintain the desired temperature. [Our own tests confirmed this.]

Accordingly, the OU announced a change of policy and will henceforth not allow the kashering of hot boxes. Thus, the OU’s standard has not changed, but rather they have become aware that the common method of kashering does not meet that standard.

**Justification of the Original Method**

**Libun kal**

We have seen that Rav Belsky’s standard for libun kal is based on a distinction between whether libun kal is performed by placing a flame directly onto the surface or by warming a chamber without a flame touching each surface. He based this on the assumption that the former case is the “standard” one discussed in the Poskim, in which they rule that it is sufficient to heat the utensil until it is yad soledes bo, because that shows that the fire’s heat has penetrated the entire thickness of the utensil. However, he reasoned that the latter case is one in which those Poskim would have demanded a different standard.

The reason to disagree with this is that the following early sources for the use of libun kal in place of hag’alah are, in fact, discussing cases that seem quite similar to the latter case:

- Gemara, Avodah Zara 33b cites a machlokes as to whether a non-kosher wine barrel can be kashered by placing burning slivers of wood (קינסא) into the barrel until the tar melts on the inside. The Gemara’s conclusion is that this is not sufficient for kashereding because it does not indicate that the heat penetrated the full thickness of the barrel. However, Tosfos infers from this that if enough heat would be placed into the barrel so as to render the outer surface of the barrel yad soledes bo, that would be sufficient to kasher the barrel.

The implication is that as long as there is enough heat inside the barrel to penetrate the full thickness of the barrel-walls, the barrel has been kashered regardless of whether the flames touch all or any surfaces of the barrel.

- Shulchan Aruch rules that if one places a new (layer onto the) “floor” in an oven, that oven can be used for baking matzos for Pesach. We understand that placing a new floor prevents chametz b’lios absorbed into the original floor from being absorbed into the Pesach matzah, but what about the b’lios in the walls and ceiling of the oven? Magen Avraham answers that when the oven is preheated for the baking of Pesach matzah, that heat will constitute a libun (kal) on the oven’s walls and ceiling.

Clearly, the oven’s flames will not touch every surface, yet the oven has been kashered. Thus, this is an example of a chamber being heated by a flame without direct contact, and Magen Avraham assumes that in the preheating of the oven the walls will surely become hot enough to have undergone libun kal. If libun kal in such situations requires that the walls merely reach yad soledes (on the outer side) we can understand why it is “automatic” that the walls are kashered during every startup. If, however, libun kal in that case requires a high heat which is maintained for an extended time, it would seem that Shulchan Aruch and Magen Avraham should have provided directions for this procedure.

These sources - coupled with the fact that no other Poskim give any indication that there is an alternate shiur for chambers than for cases where the flame is put directly onto the surface - indicate that in all cases libun kal is accomplished when the full thickness of the metal is heated to yad soledes bo. Rav Schwartz agreed with this line of reasoning. **If this is the standard which is required for all libun kal, then it is most definitely possible to kasher a hot box with Sternos, as will be described in more detail below.**

It was the author’s intention to present the above proofs to Rav Belsky for review so that he could clarify if and why he disagrees. We continue to be mispallel that Hashem should send Rav Belsky a refuah sheleimah so that he will have the strength to respond to the above points and continue in his other koloktoth.

Before concluding this section we must address two further questions - one on the lenient standard suggested above, and one on Rav Belsky’s standard.

**Home Oven**

If the above analysis is correct, we might wonder why it is commonly accepted that the method of kasherding a home oven is to turn the oven on to 550°

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56 In the words of Rabbi E. Genter, writing for the OU Poskim:

There is a grave concern that when kasherding hotel warming boxes this minimum libun temperature is not being achieved. Additionally, it has been reported that those who have tried to reach these libun temperatures have found that they have caused damage to the warmers by melting the rubber gaskets. Therefore, the OU is instructing that one should not attempt to kasher hotel warming boxes, but rather caterers must bring their own warmers with them to hotels.

57 Tosfos s.v. kinah.

58 Shulchan Aruch 461:1.

59 Magen Avraham 461:2.

60 Not only is this statement logical, but in fact the beginning of that halacha (Shulchan Aruch 461:1) notes that if one kasher an oven floor with coals (instead of putting down a new oven floor), he must make a special effort to put coals on every surface because we assume that otherwise there will not be coals everywhere.
F and leave it at that temperature for an hour. [This method is attributed to Rav Aharon Kotler.] Why must the oven be so hot and be on for so long? Does that not indicate that libun kal for an oven chamber requires more than merely heating the metal to yad soledes bo?

In order to answer this question we must first review the little known fact that there are actually two method of kashering known as "libun kal".

- Libun kal in place of hag’alah

The source that allows libun kal to be used instead of hag’alah is the Gemara cited above, and we have seen that Tosfos indicates that the required temperature is yad soledes bo (on the backside of the utensil).

In this context, it is noteworthy that after Mordecha'i records this requirement he then notes that it is common for people to test this temperature by placing a piece of straw on the utensil to see if it burns (kash nisraf). The auto-ignition temperature of straw is considerably higher than yad soledes bo, and thus the test was clearly a chumra over the technical requirement of the halacha.

- Libun kal in place of libun gamur

The Gemara says that libun is accomplished when the utensil’s surface begins to peel or when sparks begin to fly from it, but Hago’os Maimonios suggests that this is somewhat of an exaggeration and the true requirement is that the halacha reaches the temperature where straw would bum on it. Although the halacha does not accept this latter opinion, Rema rules that in situations where the requirement to perform libun is a mere chumrah we may be satisfied with this lower level of libun.

In this case, kash nisraf is not the test for libun kal but is rather the actual required temperature level.

This is in contrast to the first case where libun kal merely replaces hag’alah.

A home oven is an example of an item which requires libun as a chumrah, as follows: The walls and ceiling of a home oven are made of a material called "porcelain enamel", which is glass fused onto metal. [In addition the window in the oven’s door is made of glass.] Since the Ashkenazi custom is to be machmir and treat glass like cheres, the oven walls and door must be kasher with libun. However, since it is only a chumrah to consider glass as cheres, one may satisfy themselves by kashering those surfaces with libun kal which takes the place of libun gamur (as per Hago’os Maimonios).

[Another case where the higher level of libun kal (i.e. kash nisraf rather than yad soledes bo) is required is where one is using libun kal to incinerate small amounts of residue found on a utensil (Rema 451:4). Whether this occurs by heating a chamber to kash nisraf temperatures or whether self-cleaning temperatures of 800-1000° F are necessary, requires further study.]

Therefore, a home oven must be kasher with a much higher temperature than a hot box as it is made of different materials. The home oven requires kash nisraf, since it is made of glass, a material that requires libun kal as libun, and the hot box can be kasher with yad soledes bo since all it requires is (libun kal as) hag’alah.

Kash nisraf temperature

The discussion of home ovens and the temperature required to kasher them raises another question on Rav Belsky’s approach. Rav Belsky essentially holds that in order to kasher a chamber heated without a direct flame on the surface, the utensil must reach a temperature of kash nisraf, and that this can/should be measured with paper.

In tests that we conducted we found that if paper was placed into an oven which was preheated to 550° F the paper burned immediately.

66 In explaining how the temperatures for kasheran an oven were determined, Rav Belsky told this author (OU Document K-203) that: ..one can perform “libun kal” even without a direct flame by heating the utensil/oven until kash nisraf is reached because that also shows that the fire has penetrated the thickness of the utensil. Kash nisraf is the proper barometer for this because just like paper burns up immediately when fire is placed on it, we can reason that once paper/kash burns on a utensil the fire is having the same effect as a flame. The Poskim tested this and noticed that if paper is placed in an oven then at 550 degrees it takes only an hour for the paper to burn but at lower temperatures (450° for 1.5 hours or 375° for 2 hours) it is a slower process and takes much longer.

67 It is well known that paper auto-ignites at 451° F which is somewhat higher than the auto-ignition temperature of straw (see footnote 73), but presumably the use of paper for this test is an example of hag’alah.
paper was blackened and burnt within 10 minutes. Thus, it seems that the common practice to kasher a home oven by putting it at 550° F for an hour is a way of assuring that the entire thickness of all parts of the oven walls are truly heated to that temperature.

In contrast, most paper placed into an oven at 375° F or 450° F did not show any signs of being burnt even after being in the oven for the designated 1.5-2 hours or longer. The paper did show signs of browning the longer it stayed in the oven, but (a) there was no clear difference between paper that was in the oven for the specified amount of time as opposed to paper that was in for longer or shorter, and (b) some paper that was in the oven for the specified amount of time appeared to undergo very little change at all.

Thus, the widely accepted practice of considering 550° F (for an hour) to be considered kash nisraf seems to be firmly based on a meaningful occurrence, but it is not clear what the basis is for suggesting that kash nisraf occurs at 375° F or 450° F, even if the chamber is “held” at that temperature for an extended time.

**Kashering a Hot Box**

We have seen that there are two possible standards for kashering a hot box; Rav Belsky says that the hot box must be 550° F for an hour, 450° F for 1.5 hours, or 375° F for 2 hours, and the lower standard would only require that the hot box’s interior surfaces be heated until (the back side of) those surfaces are yad soledes. Let us now consider methods of kashering (or using) hot boxes which would satisfy these standards.

**Alternatives**

As noted, the OU suggested that people should not kasher hot boxes but rather each caterer should bring his own dedicated kosher hot boxes to each event. This will work for many situations but will make things quite difficult for (a) certain groups, such as NCSY, who “self-cater” events in remote locations far away from kosher caterers, and (b) hotels which want to be kosher for Pesach. In each of these cases, the requirement to own, store, and bring kosher hot boxes to the event will be a particular hardship.

Others have suggested that alternate methods of kashering be used:

- Some propose using a blow torch on all surfaces, but this is only reasonable for (a) Mashgichim and facilities which are comfortable using a torch on equipment, and (b) hot boxes that have no gaskets (because gaskets will melt if touched by the torch’s flame).

- Others might use a steam jenny or put pans of hot water into the hot box (with Sternos) so as to accomplish a hag’alah. For this to qualify as hag’alah, the steam would have to condense on the ceiling and walls of the hot box; if this was done correctly it would be a suitable kashering.

- Lastly, a suggestion was made that food be covered when put into the hot box. This would entail putting a layer or two of foil on the shelves/racks and some cover over the top layer of pans or plates in the hot box. This would prevent b’lios absorbed in the hot box from entering the kosher food.

**Sternos**

It would seem that the simplest suggestion would be to merely modify the original method of kashering in a manner that accomplishes the requirements of either standard above. In our testing using Sternos for kashering, different hot boxes reached 400-450° F and maintained that temperature for 30 minutes, and it seems that if we were more particular about

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70 See the pinwheel-shaped picture of papers shown in graduated color. The actual order of papers in this pinwheel – from lightest to darkest – are as follows: [Letters represent the different time and temperature (see the pictures) and those marked with a star (*) were in the oven for long enough to meet Rav Belsky’s libun kal requirements.] C, C, C, F, F, F, C, A, D, D, A, A, A, A, A, A, D, A, D, B, G, G, B, B, B, G, G, E, E, G, G.

71 If non-kosher flavor is absorbed purely via steam, then the hot box could be kasher with steam based on the principle of ṭamei ṭamei (Maharsham 1:92). However, if the non-kosher steam had condensed into liquid those areas would have to be kasher with water (i.e. condensed steam) that is at a hag’alah temperature (based on Iggeros Moshe YD 1:60).
the number and type of Sternos used we could easily reach 450° F and maintain that temperature for 1.5 hours (and possibly even reach 550° F), as discussed below.

Fuels
A study of more than 20 types of Stemo-like chafing dish warmers manufactured by a half dozen manufacturers showed that they all use one of three fuels: ethanol, methanol, or diethylene glycol (DEG). [Some use ethanol with a bit of methanol mixed in.] Of those fuels:

- The first two are gels, while DEG is used as a liquid with the flame on a wick.
- Ethanol consistently provides the most BTU per hour (i.e., the most heat), closely followed by methanol. In almost every case, the liquid DEG provides considerably less BTU than the others.
- The canisters made by different manufacturers provide different amounts of BTU per hour and total BTU. These differences depend on the amount and percentage of fuel in each canister, the size of the canister’s opening, and (likely) other factors.
- Since the ethanol and methanol burn without a wick, the canister that holds them becomes hot, and that heat spreads to the floor upon which they rest. In contrast, DEG burns on a wick that is suspended above the canister, such that the floor underneath the canister will not get hot/kashed.

Thus in choosing a Stemo for use in kashering, one should definitely not use a DEG/liquid/wicked canister. It would be best to use an ethanol-based gel, and a second choice would be to use one that is methanol-based. Of the ethanol-based gels, the ones we are familiar with that provide the highest amount of BTU per hour are the Stemo brand, and the FancyHeat brand (red or green).

Number of Sternos
Many seasoned Mashgichim feel comfortable judging how many Sternos to use when kashering a hot box, but for the purposes of this article – and in particular, for those who want to satisfy Rav Belsky’s higher standard of libun kal – we made a more formal calculation of how many Sternos are required. Based on the goal of heating the chamber to 450° F in approximately 40 minutes, and under the assumption that a person is using one of the Sternos recommended in the previous section, we advise the following:

<table>
<thead>
<tr>
<th>Hot Box Size</th>
<th>Cubic Inches</th>
<th>Ethanol Sternos</th>
<th>Methanol Sternos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra large</td>
<td>&gt;80,000</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Large</td>
<td>70-80,000</td>
<td>9</td>
<td>10-11</td>
</tr>
<tr>
<td>Medium</td>
<td>60-70,000</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Small</td>
<td>&lt;60,000</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Full upright</td>
<td>20-40,000</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Half upright</td>
<td>&lt;20,000</td>
<td>3</td>
<td>3-4</td>
</tr>
</tbody>
</table>

For more details on the sizes of hot boxes used in the above chart, see footnote 50.

The recommended Sternos each burn for approximately 2 hours, and for those who want to satisfy the OU’s requirements of having a temperature of 450° F for 1.5 hours, the aforementioned recommendations would fall just short of that amount of time. [In addition, in our testing we noticed that the temperature of the hot box tended to drop towards the end of cycle, such that there would likely be only about an hour at 450° F]. Accordingly, we recommend that those who would like to fulfill the OU requirements should insert a second set of lit Sternos into the hot box towards the end of the 2 hours and wait until this second set burns out before declaring the hot box to be kashed.

Position of Sternos
Many Mashgichim randomly scatter the Sternos around the hot box during kashering. In our testing of this procedure we noticed that when this was done there were two areas that did not get as hot as the others. Those areas were the bottom part of the hot

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Footnotes:
12 One exception that was found was that the liquid CandleLamp is made of a "proprietary blend of glycols" which contains 0% DEG.
13 BTU = British Thermal Units, a standard method of measuring energy by the amount of water it can heat.
14 Based on information provided by four manufacturers, the average BTU per hour in Stemo-like canisters was 1,767 for ethanol, 1,463 for methanol, and only 866 for DEG (or 1,021 if one includes the double-wicked DEG canisters).
15 The exception was that some DEG canisters that come with two wicks the fuel burns so quickly as to provide more (or equal) BTU per hour than the gels. It is also worth noting that a particular popular DEG canister which is billed as being particularly "hot", does in fact burn considerably more BTU per hour than other DEG canisters (~1,300 vs. ~800-900 for most others) but is still only about 2/3 the strength of the best ethanol canisters.
16 There was a surprisingly wide range of BTU per canister. In approximately 20 varieties the BTU per hour ranged from 778-1,966 and the total BTU in the canister was 1,430-5,460.
17 The liquid/wicked products were (basically) all 100% DEG, and the range of percentages of the primary ingredients in different canisters was ethanol ~ 65-78%, and methanol ~ 70-75%.
18 The standard opening size for gels is 2 inches. An opening of a different size would allow for fuel to burn at a different rate.
19 The two reasons for this are, as noted, that (a) DEG generally provides fewer BTU per hour, and (b) the can (and area below it) do not get hot.
20 The range of BTU per hour for methanol-based gels (for those that shared information with us) was 1,430-1,550.
21 The Stemo brand ethanol canisters claim to provide 1,966 BTU per hour, and the FancyHeat (red and green) cans claim to provide 1,860 BTU per hour.
22 A good portion of the calculations were based on formulas and charts presented on pages 141-151 of the HotWatt 2010 Catalogue which can be found at http://bit.ly/wz7owi. The calculations considered the energy required to heat the chamber and the heat lost through the insulation and from the door.
23 The time and temperature were chosen because they were not only reasonable choices that could be accomplished without apparent fear of ruining the gaskets, but were also simultaneously in the range of Rav Belsky’s libun kal requirements.
box and the floor space near the door. The reasons for this and the proposed solutions to these concerns are presented in the chart below:

<table>
<thead>
<tr>
<th>Area</th>
<th>Reason</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom 1/4 of the hot box walls</td>
<td>Heat rises</td>
<td>Place all Sternos on the floor of the hot box</td>
</tr>
<tr>
<td>Floorspace between the Sternos and the door</td>
<td>Ambient temperature air</td>
<td>Place 2-3 of the Sternos near the door</td>
</tr>
<tr>
<td></td>
<td>leaking in from the door</td>
<td></td>
</tr>
</tbody>
</table>

A related complication of kashering a hot box is that if the door is open at all, hot air will be allowed to escape, but if the door is sealed shut then no oxygen will enter the box, and the flames will be extinguished. The proper compromise for this conundrum appears to be that if the hot box has gaskets around the door (which would seal it well) then the door should be left open slightly during kashering, and if the door does not have gaskets then it can/should be tightly closed (and enough oxygen will leak through the door to maintain combustion).

**Kashering Procedure (Summary)**

Based on the information presented above, the following is the recommended procedure for kashering a hot box:

1. Clean the hot box thoroughly, and do not use it for 24 hours.
2. Calculate the correct number of 2-hour ethanol or methanol Sternos (preferably ethanol-based canisters of the Sterno or FancyHeat brands) based on the size of the hot box. [Liquid diethylene glycol canisters should not be used.]
3. Put Sternos into the hot box, placing 2-3 near the door.
4. Light the Sternos, and close the hot box's door.
   - If there is no gasket around the door, close the door tightly.
   - If there is a gasket around the door, leave the door open very slightly.
5. Keep the door closed until all Sternos have burnt out (and have had a chance to cool off).
6. Those wishing to kasher hot boxes according to the OU standard should do as follows, approximately 1.5 - 2 hours after Step 4 is performed:
   - Extinguish approximately half of the original Sternos
   - Add a second set of Sternos to the hot box as per the following chart:

<table>
<thead>
<tr>
<th>Hot Box Size</th>
<th>Ethanol Sternos</th>
<th>Methanol Sternos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra large</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Large</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Medium</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Small</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Full upright</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Half upright</td>
<td>2-3</td>
<td>3</td>
</tr>
</tbody>
</table>

- Place 2-3 of the new Sternos near the door, light the Sternos and close the hot box's door (as above).
- Light the Sternos and close the hot box's door.
- Keep the door closed until all Sternos have burnt out (and have had a chance to cool off).

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84 It was noted in footnote 51 that it is not clear that there is truly a need to kasher the floor of the hot box. The procedures in the text are written under the assumption that the entire floor does require kashering.
85 Some Mashgichim attempt to solve this concern by emptying gel from a Sterno and placing the gel directly onto the floor of the hot box. This procedure raises serious safety concerns (in addition to the inability to properly judge the correct amount of gel to use, and the fact that “loose” gel will burn considerably faster than gel in a can) and we therefore do not recommend this practice.
86 Although it is generally accepted that the letter of the law is that one may perform libun kal even if the item is ben yomo (implicitly rejecting the idea considered by Pi Megadim MZ 452-4), it is also prudent for all kashering to be performed when equipment is aino ben yomo (along the lines of Rema 452:2).