Using the partition coefficient based on the average temperatures, or the maximum temperatures does not introduce a significant change to the order of the maximum temperature. It is assumed in the analysis above that the Peclet number associated with the moving source

\[
\frac{r_0 V}{2D_2}
\]

has a value larger than 5. If the Peclet number is smaller than 5 then the maximum and average temperatures can be predicted from

\[
T = 0.2026 \frac{Q_2 D_2}{r_0^2 k_2 V}
\]

where the value of \( \gamma \) can be determined from Fig. 7 of reference [15] for maximum or average temperatures. It is approximately the value of the ordinate for the square source of side equal to the diameter of the circular source, where the abscissa is the Peclet number.

Equating the average temperatures yields

\[
\epsilon = \frac{k_1}{k_1 + \frac{2.468}{\gamma} PE k_2}
\]

hence for the slow moving source the maximum contact temperature is

\[
T_{\text{max}} = \frac{r_0}{k_1} \frac{k_1}{k_1 + \frac{2.468}{\gamma} PE k_2}
\]

Equating the maximum temperatures yields the same expression but the constant 2.468 is replaced by \( \gamma \). The value of \( \gamma \) for this case corresponds to the "maximum" temperature of the square source in Fig. 7 of the reference [15].

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**DISCUSSION**

A. Floquet

The authors have studied flash temperatures in the vicinity of a small stationary circular heat source. With such a circular source, calculations were very complicated because they use Bessel and hypergeometric functions which are not easy to manipulate. The authors are to be congratulated for their successful calculations. I think, however, that a square source analysis would require simpler calculations and according to Blok* would give identical trends.

Some other results presented are both original and important. Steady state regime is obtained after a very short contact duration and consequently the temperature drop after heating is equally fast. Thus, it seems that a body reacts with a small time lag to heating and then absorbs all the energy by conduction, convection losses being negligible. This fact is very important because, as the authors state, the presence of fluid film, or more generally in dry friction of third bodies, does not eliminate the occurrence of hot spots and possibly not affect the flash temperature levels.

The analysis used in the determination of partition coefficient when compared to the rest of the analysis is rather elementary. Would it not be possible to equate point by point contact temperatures, using the results given by equation (6) for example?

The authors discussed the effect on temperatures rises of surface coating. I agree when they state that a layer greater than 10\( \mu \)m in thickness can be assimilated to an infinite body in the thermal analysis. The problem is very much more difficult when oxide films, which are very thin, are present. Do you think that your calculations can be extrapolated to the case of a semi-infinite body covered by a very thin insulating layer?

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**Authors’ Closure**

The authors would like to thank Dr. Floquet for his interest and comments on the paper.

As the discusser points out, the square and circular sources having the same characteristic dimension, \( l \), yield similar (but not identical) results. They are [15]:

\[
\frac{k T_{\text{max}}}{q f} = \begin{cases} \frac{1.0 \text{ circular}}{1.122 \text{ square}} \\ \frac{0.88 \text{ circular (present study)}}{0.946 \text{ square}} \end{cases}
\]

Derivation of the two-dimensional transient expressions for the square source may be simpler, but may still require some numerical evaluations [15, A1]. Presently, a circular geometry is preferred primarily due to the resemblance to the observed phenomena [10].

The authors agree that the partition problem outlined in the Appendix is rather elementary. It is presented there to indicate that the Peclet number evaluated at asperity dimensions (< 100 \( \mu \)m) even at high speeds can be small, hence, a considerable amount of heat will go to the stationary body.

As to the discusser's comment on "point by point matching of the two surface temperatures," the authors would like to mention a practical method to obtain the partition "distribution" in the contact.

A band-shaped contact with uniform heat generation is considered for its simplicity where the surface temperatures at the contact between two moving surfaces is given by [15]:

\[
T_1 = \frac{q f}{\pi k_1} \int_0^1 F_1(\eta, x, s) \epsilon(s) ds + T_{B_1}
\]

\[
T_2 = \frac{q f}{\pi k_2} \int_0^1 F_2(\eta, x, s)(1 - \epsilon(s)) ds + T_{B_2}
\]

where \( F_i = \exp[-Pe_i(x - s)]K_0(\eta, x - s) \) \( i = 1, 2 \)

\( q_f \) = Total heat flux, and \( T_{B_i} \) are the bulk temperatures

Equating the temperatures yields:

\[
\int_0^1 (F_1 + \frac{k_1}{k_2} F_2) \epsilon(s) ds = \frac{\pi k_1 (T_{B_2} - T_{B_1})}{q f} + \frac{k_1}{k_2} \int_0^1 F_2(x, s) ds
\]

This is a nonhomogeneous Fredholm integral equation of the first kind, where the unknown function \( \epsilon \) is the partition distribution. Discretization for the purpose of numerical integration yields \( n \) linear equations in \( n \) unknowns.

\[
\sum_{j=1}^{n} C_j \left[ F_1(\eta, s_j) + \frac{k_1}{k_2} F_2(\eta, s_j) \right] \epsilon(s_j)
\]

\[
= \frac{\pi k_1 (T_{B_2} - T_{B_1})}{q f} + \frac{k_1}{k_2} \int_0^1 F_2(x, s) ds
\]

where \( J = 1, \ldots, n \) and \( C_j \) are the appropriate coefficients for the numerical integration formula.

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*Assistant, Laboratoire de Mecanique des Contacts, Institut National des Sciences Appliques de Lyon, Batiment 112-30, Avenue Albert Einstein, 69621 Villeurbanne, Cedex, France.
It should be mentioned, however, that a noticeable non-uniformity in the partition is expected only when one surface has a small and the other has a large Peclet number, in which case, however, most of the total heat is expected to go to the surface having the large Peclet number.

Present solutions do not apply in the case of a thin surface film on the semi-infinite body.

Additional Reference