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Effect of parameter values on gas and matrix temperature fields in rotary heat exchangers

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Abstract—Two variants of models related to transport phenomena of energy in a rotary heat exchanger are presented: one excluding and the other including longitudinal heat conduction in the matrix. The systems of energy balance equations corresponding to the above models are solved by means of analytical methods, and the results of computations are plotted. On the basis of these solutions, the effects of parameter values on the gas and matrix temperature fields are evaluated.

1. INTRODUCTION

AN ADVANTAGE of rotary heat exchangers as compared with the conventional shell-and-tube or plate-fin types is that they have a considerably larger and less expensive heat transfer area per unit volume. Thus the rotary heat exchangers combine both compactness and high performance.

As is known from the literature, transport phenomena of energy in rotary heat exchangers have been modelled by systems of partial differential equations formulated with various simplifying assumptions. These models, supplemented by appropriate boundary conditions, for steady-state operation can be classified as disregarding [1–12] or including [13–18] thermal conduction in the matrix.

For the problems indicated above, suitable systems of energy balance equations are solvable with the use of analytical [1, 6–10, 17, 18], mixed [2, 11] and numerical [3, 5, 12–16] approaches.

On the other hand, the solutions obtained are generally presented by means of tables or charts for functional η–NTU_o relationships when heat conduction is disregarded [2, 3, 11, 12] or η–NTU_o relationships at λ^* = constant in cases where matrix heat conduction is taken into account [13, 19]. In some papers [1, 6–10, 14–18], the gas and matrix temperature fields are presented in the form of graphs or tables.

The matrix thermal conduction effect on the temperature distributions in rotary heat exchangers was evaluated in refs. [14, 18]. Mondt [14] found that it causes a reduction of the temperature drops. Reference [18] presents the results of investigations on the effects of matrix longitudinal heat conduction on the temperature fields of gases and the matrix in rotary heat exchangers at $NTU_1 = NTU_2$ ranging from 2 to 10 for $NTU_{m,1} = NTU_{m,2} = 0.2$ and 1, respectively.

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In the present study, attention is directed to showing the effect of various parameters such as NTU_j, NTU_m, NTU_o and Pe_j^{-1} on the gas and matrix temperature fields, excluding and including longitudinal thermal conduction in the matrix. This is carried out by means of the temperature charts plotted from the results of computations and the distance between temperature fields.

2. THE SOLUTIONS

2.1. *Disregarding matrix longitudinal thermal conduction*

In this case, after introducing the dimensionless coordinates and parameters defined in the Nomenclature and using the assumptions usually formulated, the systems of energy conservation equations describing the temperature fields in a rotary heat exchanger can be written in non-dimensional form (for the dimensional form see ref. [18]) as follows:

$$\frac{\partial \vartheta_j}{\partial \varphi} = NTU_{m,j}(-\vartheta_j + \theta_j)$$

$$\frac{\partial \theta_j}{\partial z} = NTU_j(\vartheta_j - \theta_j), \quad j = 1, 2 \tag{1}$$

where the coordinates are shown in Fig. 1. Simultaneously, the systems of equations are supplemented by the following boundary conditions:

$$\theta_1(\varphi, z = 0) = 1 \tag{2}$$

$$\theta_2(\varphi, z = 0) = 0 \tag{3}$$

$$\vartheta_1(\varphi = 0, z) = \vartheta_2(\varphi = 1, 1 - z) \tag{4}$$

$$\vartheta_1(\varphi = 1, z) = \vartheta_2(\varphi = 0, 1 - z). \tag{5}$$

The solutions to the problems are constructed in ref. [18], being based on the general solution of equations (1) expressed by functions $Bs_n(x, y)$ and $Bes_n(x, y)$ at $n = 0, \pm 1, \pm 2, \ldots$ and given by Łach and Pieczka [20] for a crossflow recuperator. These solutions are used

NOMENCLATURE

c	specific heat capacity
c_p	gas specific heat capacity at constant pressure
d	distance between temperature fields
h	matrix height
S	total section of metal matrix for longitudinal heat conduction [13]
t	matrix temperature
T	gas temperature
v	velocity of gas in matrix
W	heat capacity rate
Y	matrix heat transfer area per unit volume.

Greek symbols

α	heat transfer coefficient
ε	porosity of matrix
ζ, ϕ	coordinates: ζ is along the matrix in the direction of the gas flow; ϕ is in the direction of rotation of the matrix
η	exchanger heat transfer effectiveness
ρ	density
ψ	zone angle
ω	rotational speed.

Subscripts

j	1 in heating zone, 2 in cooling zone
m	matrix
m, j	matrix in the jth zone.

Superscript

$'$	at the inlet

Dimensionless quantities

NTU	number of transfer units for gas, $\alpha Yh/(\varepsilon\rho c_p v)$
NTU_m	number of transfer units for metal matrix, $\alpha Y\psi/[(1-\varepsilon)\rho_m c_m \omega]$
NTU_o	overall number of transfer units [11], $[(1/NTU_2)+((NTU_{m,2}/NTU_2) \times (NTU_1/NTU_{m,1}))(1/NTU_1)]^{-1}$
Pe	Peclet number of metal matrix, $[\lambda_m\psi/(\rho_m c_m \omega h^2)]^{-1}$
z	longitudinal coordinate, ζ/h
ϑ	matrix temperature, $(t-T'_2)/(T'_1-T'_2)$
θ	gas temperature, $(T-T'_2)/(T'_1-T'_2)$
φ	coordinate in direction of rotation, ϕ/ψ
λ^*	conduction parameter [13], $S\lambda_m/(W_{min}h)$

here for finding the temperature fields in each crossflow gas–matrix heating and cooling zone. A detailed description of the method can be found in ref. [18].

2.2. *Including matrix longitudinal heat conduction*

Several simplifying assumptions usually formulated for this case were used. These are:

(a) the temperature variations in the radial direction are not considered;

(b) the thermal properties of both fluids and matrix, and also the heat transfer coefficients, are regarded as temperature independent;

(c) the mass flow rate of the fluid in each zone is constant;

(d) the transport of energy with fluids as a result of carryover in the direction of rotation is neglected.

From the assumptions given above, the governing equations (for the coordinate system, see Fig. 1) for the problem can be written in non-dimensional form (for the dimensional form see ref. [18]) as follows:

$$\frac{\partial \vartheta_j}{\partial \varphi} = NTU_{m,j}(-\vartheta_j + \theta_j) + Pe_j^{-1}\frac{\partial^2 \vartheta_j}{\partial z^2}$$

$$\frac{\partial \theta_j}{\partial z} = NTU_j(\vartheta_j - \theta_j), \quad j = 1,2. \tag{6}$$

The corresponding dimensionless boundary conditions are

$$\theta_1(\varphi, z=0) = 1 \tag{7}$$

$$\theta_2(\varphi, z=0) = 0 \tag{8}$$

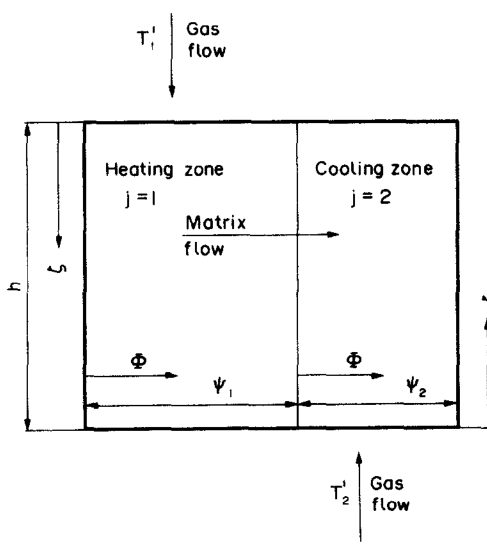


FIG. 1. The coordinates and some denotations related to rotary heat exchangers.

Table 1. Parameter values used in calculations when matrix thermal conduction was neglected

$\frac{NTU_2}{NTU_1}$	$\frac{NTU_{m,2}}{NTU_2}\frac{NTU_1}{NTU_{m,2}}$	NTU_o	Fig. No. Gases	Fig. No. Matrix	$\frac{NTU_{m,2}}{NTU_2}$
1	1	0.5	2(a)	3(a)	1 0.75 0.5 0.25
		4	2(b)	3(b)	1 0.75 0.5 0.25
		16	2(c)	3(c)	1 0.75 0.5 0.25
	0.8	0.5	2(d)	3(d)	1 0.75 0.5 0.25
		4	2(e)	3(e)	1 0.75 0.5 0.25
		16	2(f)	3(f)	1 0.75 0.5 0.25

$$\vartheta_1(\varphi = 0, z) = \vartheta_2(\varphi = 1, 1-z) \quad (9)$$

$$\vartheta_1(\varphi = 1, z) = \vartheta_2(\varphi = 0, 1-z) \quad (10)$$

$$\partial\vartheta_j[\varphi, (z = 0 \text{ and } 1)]/\partial z = 0, \quad j = 1, 2. \quad (11)$$

The solution of the problem is given in refs. [17, 18], where the method of separation of variables has been applied. For both cases described above, the solutions presented in ref. [18] are used here.

3. EFFECT OF PARAMETER VALUES ON THE TEMPERATURE FIELDS

Computations for the gas and matrix temperature fields were made using the parameter values given by Romie [11]. The denotations of the parameters used in this paper as compared with that of Romie is given in the Appendix. The parameter values, the ranges of which are the subject of the present paper, are given in Tables 1 and 2.

3.1. *Analysis of the results*

3.1.1. *Excluding longitudinal matrix thermal conduction effect.* The gas and matrix temperature distributions in the rotary heat exchangers using the parameter values presented in Table 1 are shown in Figs. 2 and 3. The analysis of the temperature fields shows that at NTU_o = constant, the reduction of $NTU_{m,2}/NTU_2$ values results in a reduction of temperature changes in the direction of matrix rotation. An increase in NTU_o values causes an increase in the temperature changes along the matrix in the direction of the gas flow and rotation. As a result, the gas and matrix temperature fields are markedly nonlinear—see Figs. 2(c), (f) and 3(b), (c), (e), (f). The effect of the reduction of $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ values shown in Figs. 2 and 3 ((a), (b), (c)–(d), (e), (f)) is of particular interest. From this it is seen that, as a result, a reduction of the temperature drops in the direction of the gas flow in the heating zone (1) is also obtained. In the other zone, increases in the gas and matrix temperatures are shown.

The effect of the parameter values selected as above was evaluated numerically. Various methods for a numerical evaluation of the effect of parameter values on the gas and matrix temperature fields may be used. Generally these can be classified into two categories:

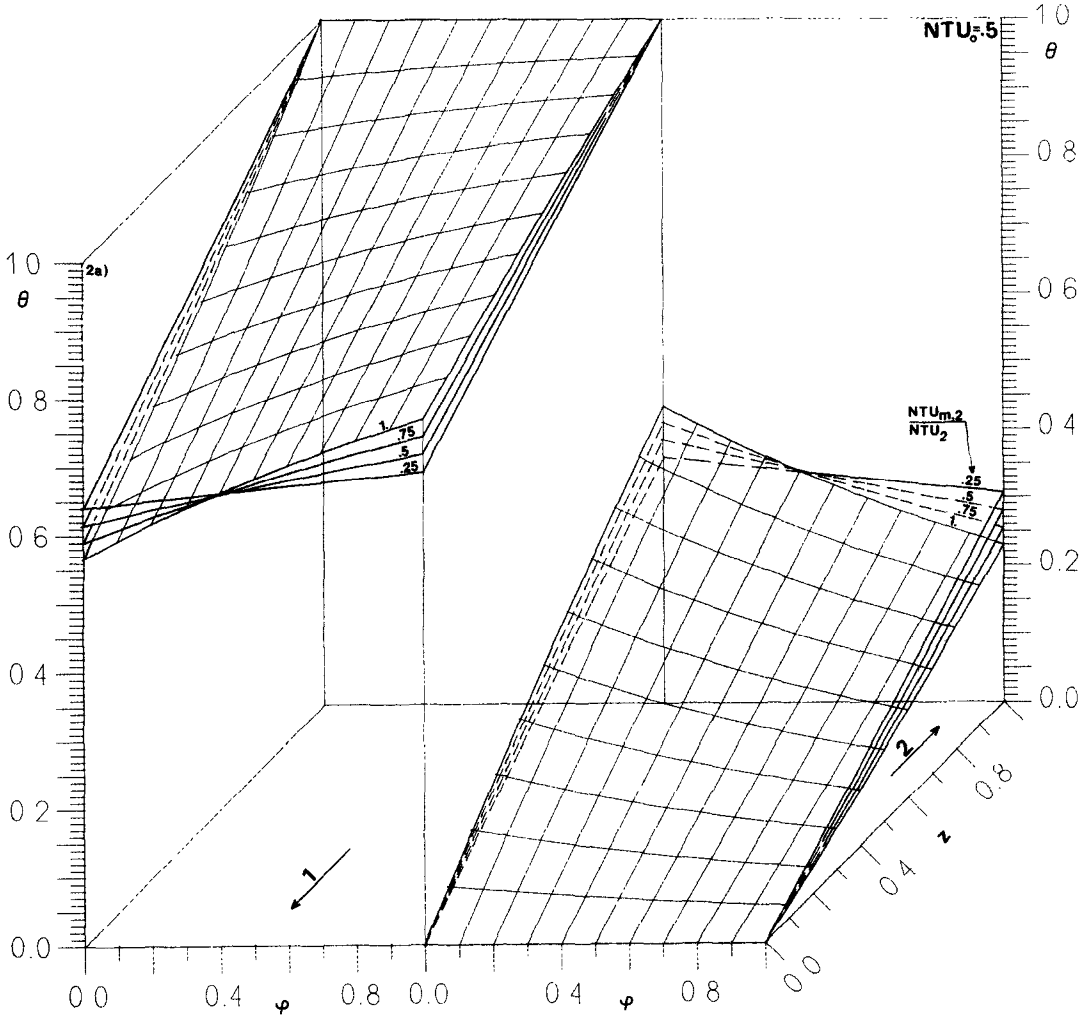
(a) methods using the general principles of the sensitivity theory, e.g. ref. [21];

(b) measurement of the effect by means of various norms known from functional analysis.

In this paper, as a measure of the effect, a norm value calculated from the difference between the functions determining the temperature fields at various parameter values was applied. The norm, analogous to the distance between two functions (see, e.g. ref. [22]), is called in this paper the distance between temperature fields and is described by the following for-

Table 2. Parameter values used in calculations when matrix thermal conduction was taken into consideration

$\frac{NTU_2}{NTU_1}$	$\frac{NTU_{m,2}}{NTU_2}\frac{NTU_1}{NTU_{m,1}}$	NTU_o	Fig. No. Gases	Fig. No. Matrix	$\frac{NTU_{m,2}}{NTU_2}$	Pe^{-1}
1	1	0.5	6(a)	7(a)	0.5	0 0.005 0.1
		4	6(b)	7(b)	0.5	0 0.005 0.1
		16	6(c)	7(c)	0.5	0 0.005 0.1
	0.8	0.5	6(d)	7(d)	0.5	0 0.005 0.1
		4	6(e)	7(e)	0.5	0 0.005 0.1
		16	6(f)	7(f)	0.5	0 0.005 0.1



(a)

FIG. 2. Effect of $NTU_{m,2}/NTU_2$ values, NTU_o values ((a), (b), (c) or (d), (e), (f)) and $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ ((a), (b), (c) equal to 1, (d), (e), (f) equal to 0.8) values on the gas temperature distributions in a rotary heat exchanger where $NTU_2/NTU_1 = 1$ (thermal conduction excluded).

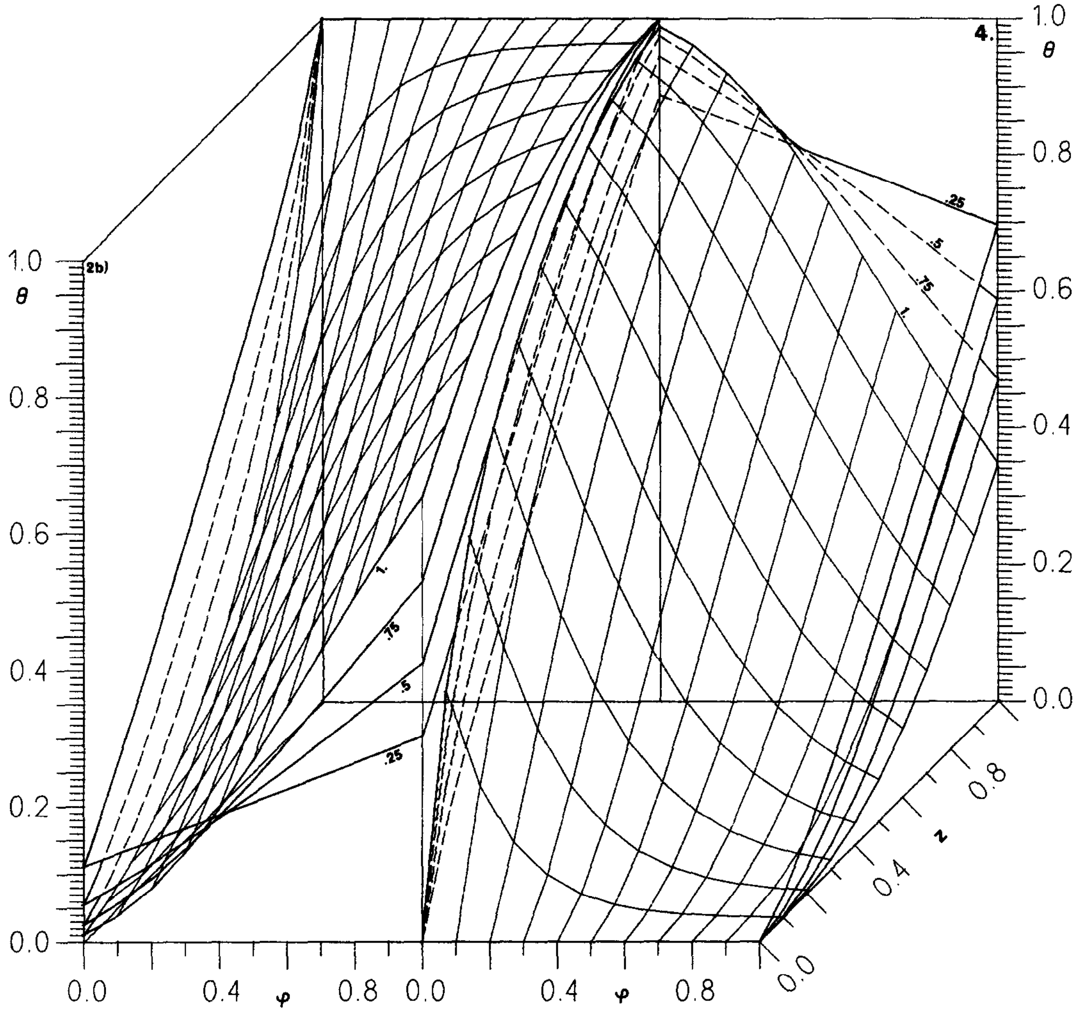


FIG. 2(b).

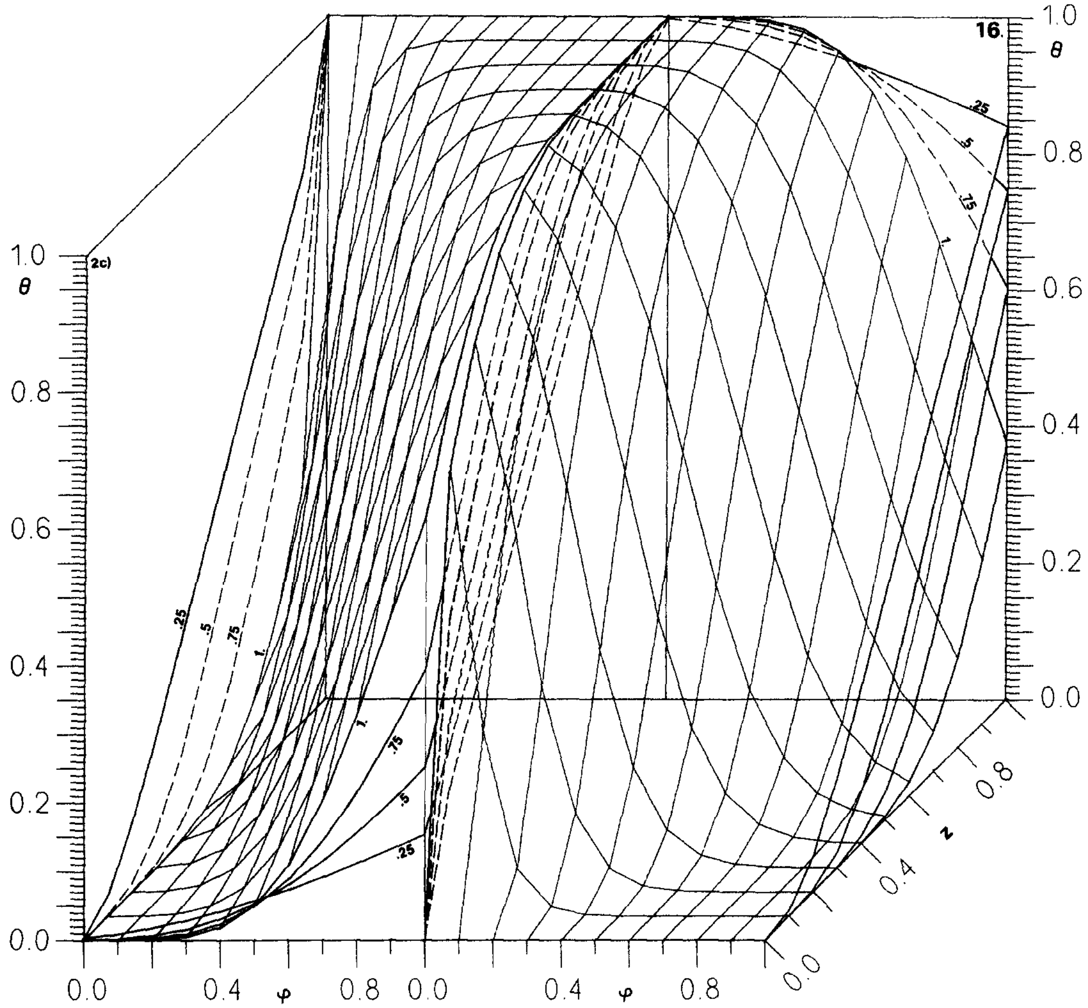


FIG. 2(c).

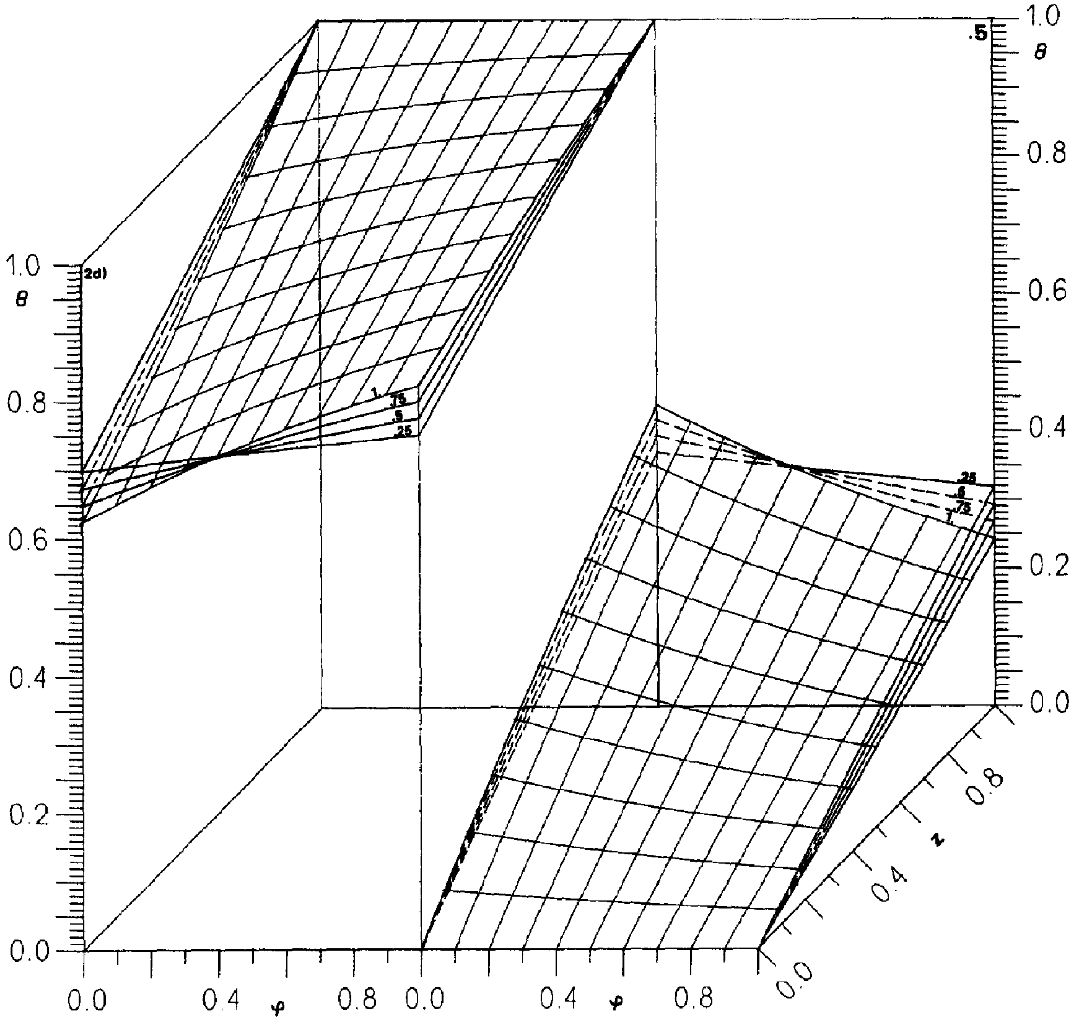
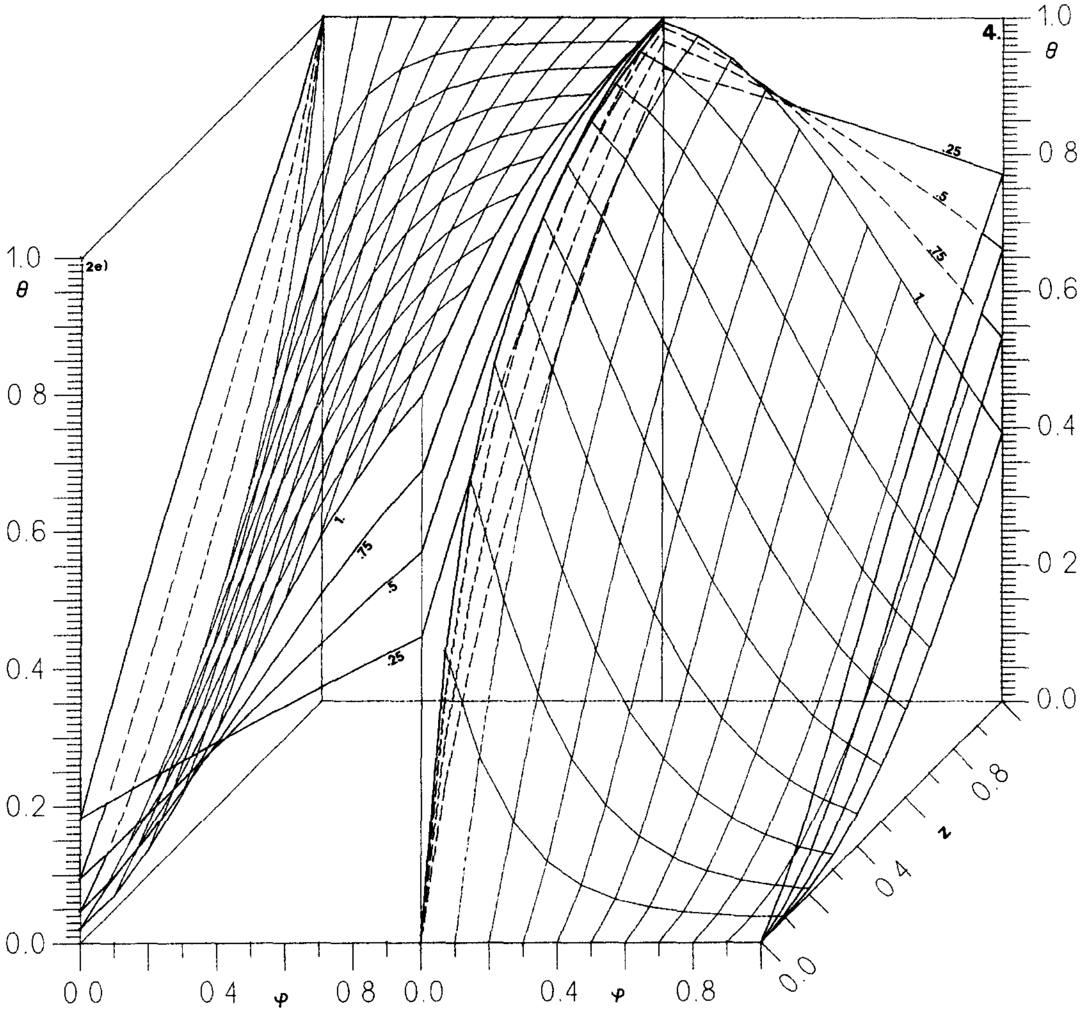

2d)
1.0
θ
0.8
0.6
0.4
0.2
0.0
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
0.0
0.4
z
0.8
1.0
θ
0.8
0.6
0.4
0.2
0.0
.5
1
.75
.5
.25
.25
.5
.75
1

FIG. 2(d).



1.0
θ
2e)
0.8
0.6
0.4
0.2
0.0
1.
.75
.5
.25
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
4.
1.0
θ
.25
.5
.75
1.
0.8
0.6
0.4
0.2
0.0
0.8
z
0.4
0.0

Fig. 2(e).

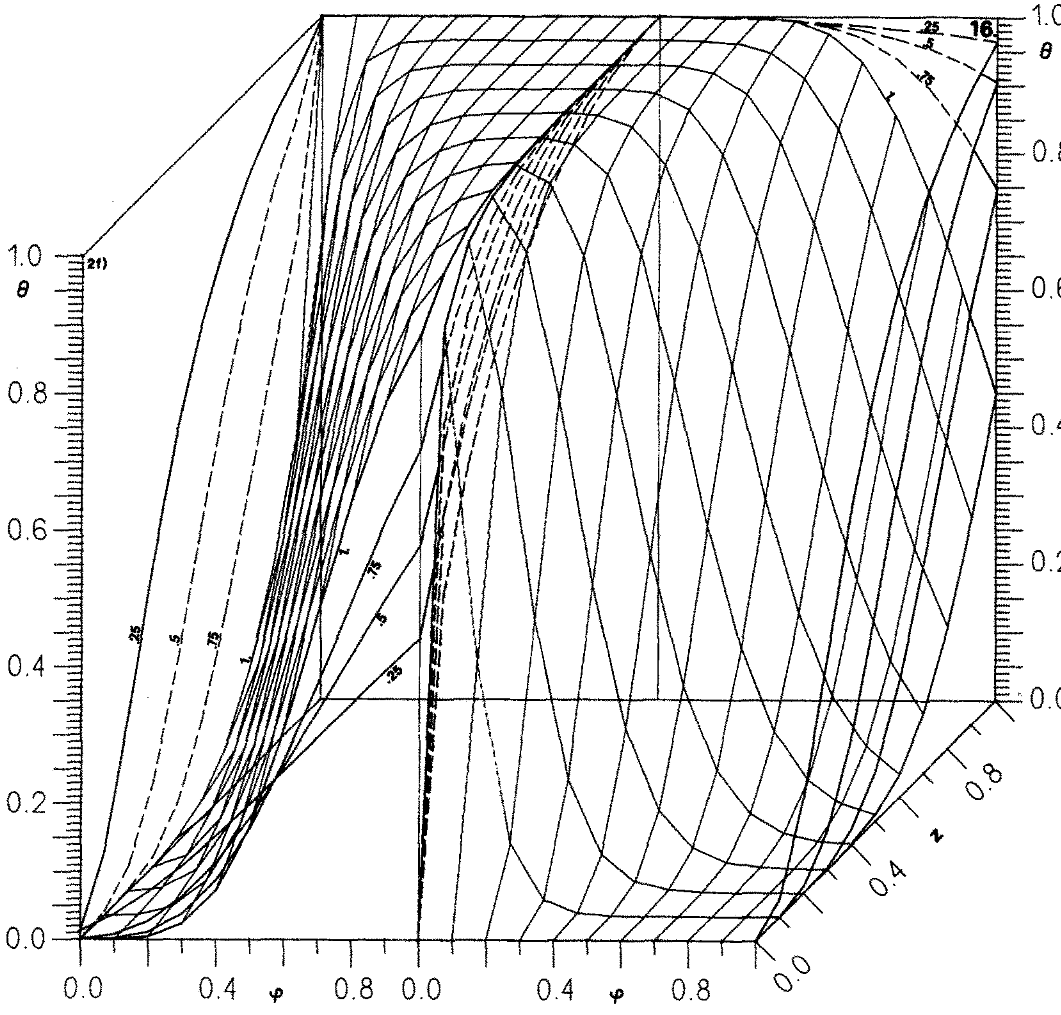
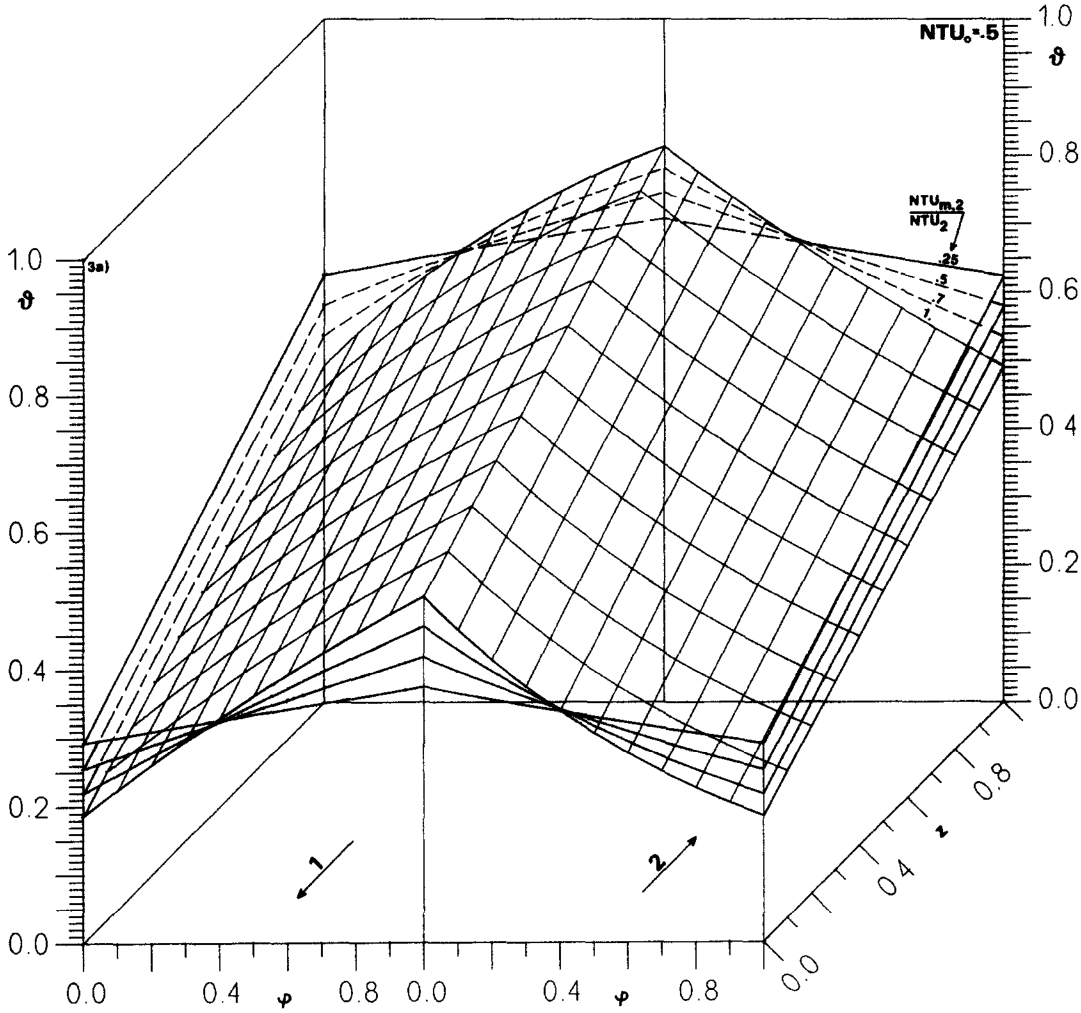


FIG. 2(f).



(a)

FIG. 3. Effect of $NTU_{m,2}/NTU_2$ values, NTU_o values ((a), (b), (c) or (d), (e), (f)) and $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ ((a), (b), (c) equal to 1, (d), (e), (f) equal to 0.8) values on the matrix temperature distributions in a rotary heat exchanger where $NTU_2/NTU_1 = 1$ (thermal conduction excluded).

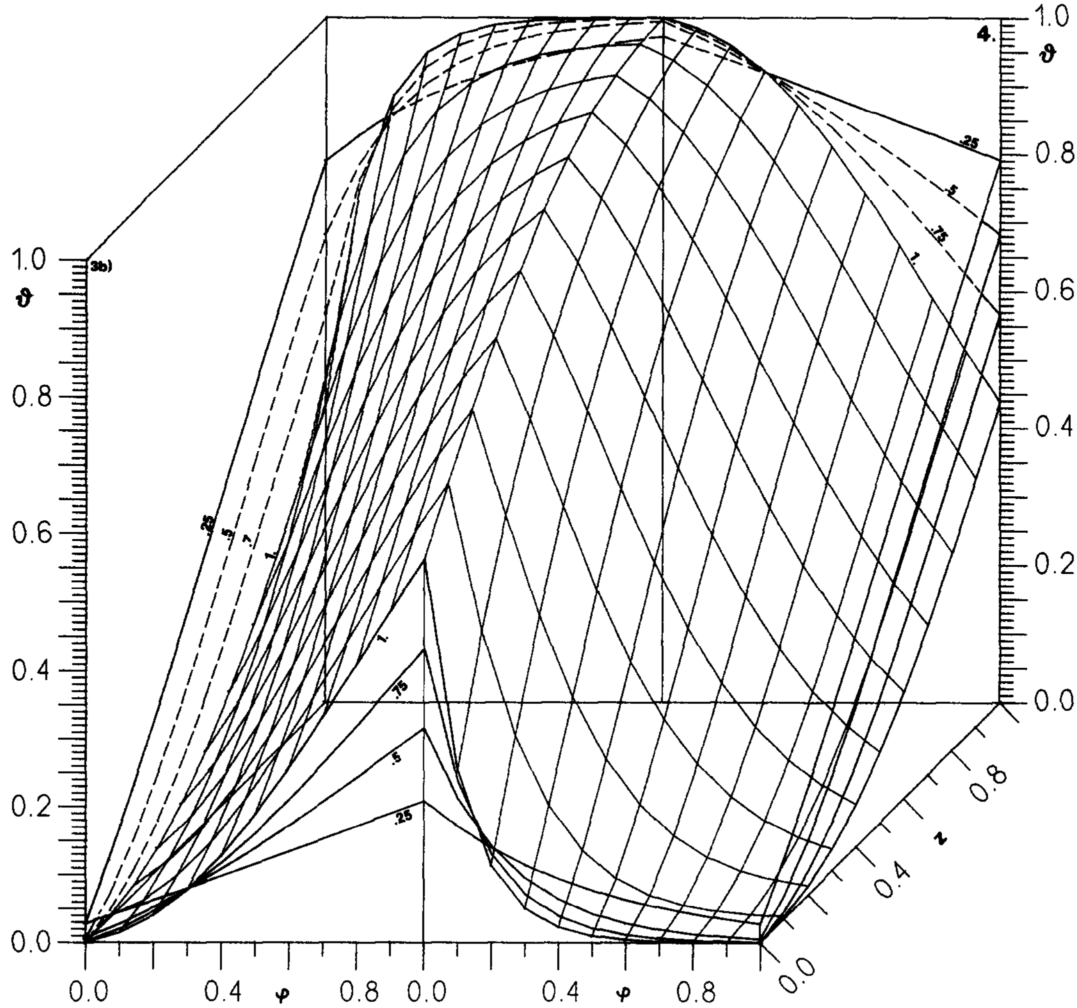

1.0
ϑ
0.8
0.6
0.4
0.2
0.0
3b)
4.
1.0
ϑ
0.8
0.6
0.4
0.2
0.0
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
0.0
0.4
z
0.8

FIG. 3(b).

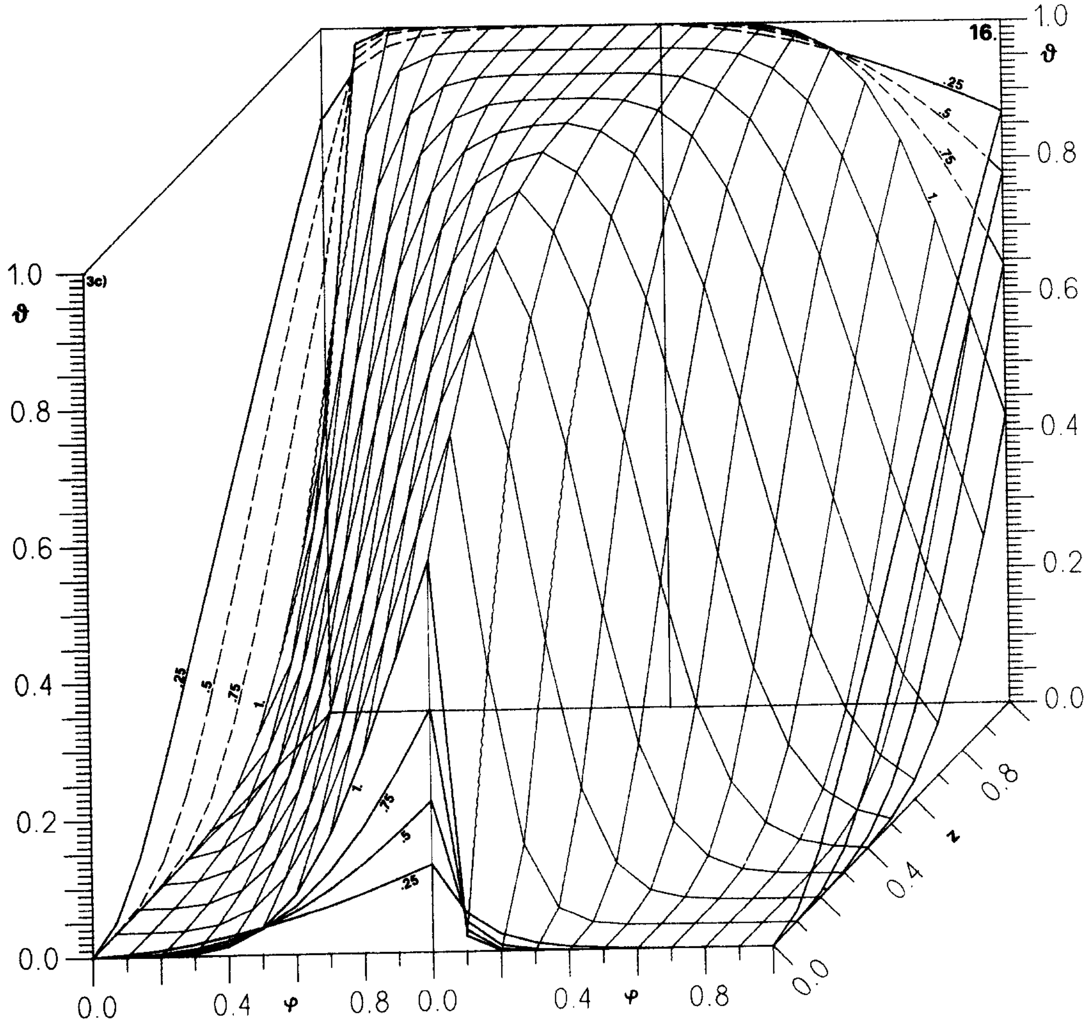


FIG. 3(c).

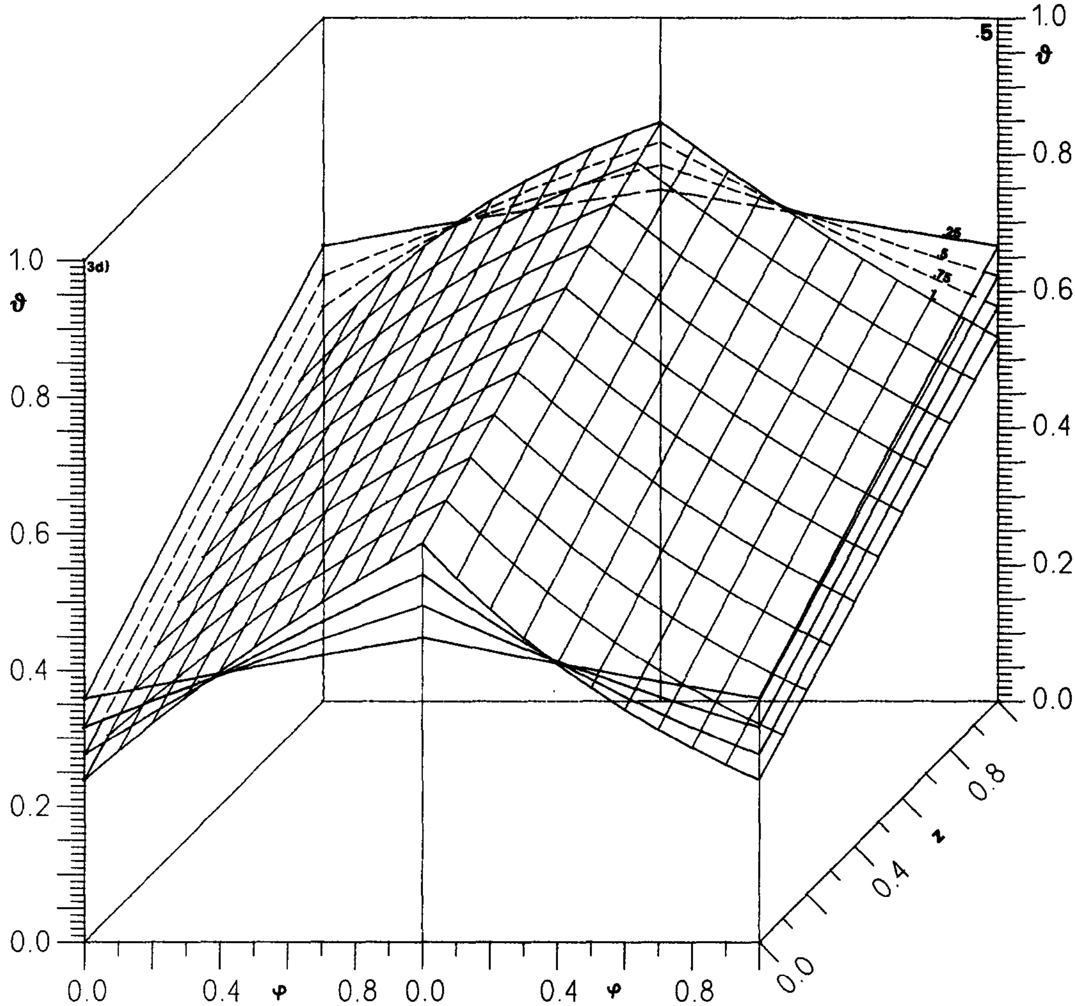

3d)
1.0
0.8
0.6
0.4
0.2
0.0
ϑ
.5
.25
.5
.75
1
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
0.0
0.4
0.8
z
1.0
0.8
0.6
0.4
0.2
0.0
ϑ

FIG. 3(d).

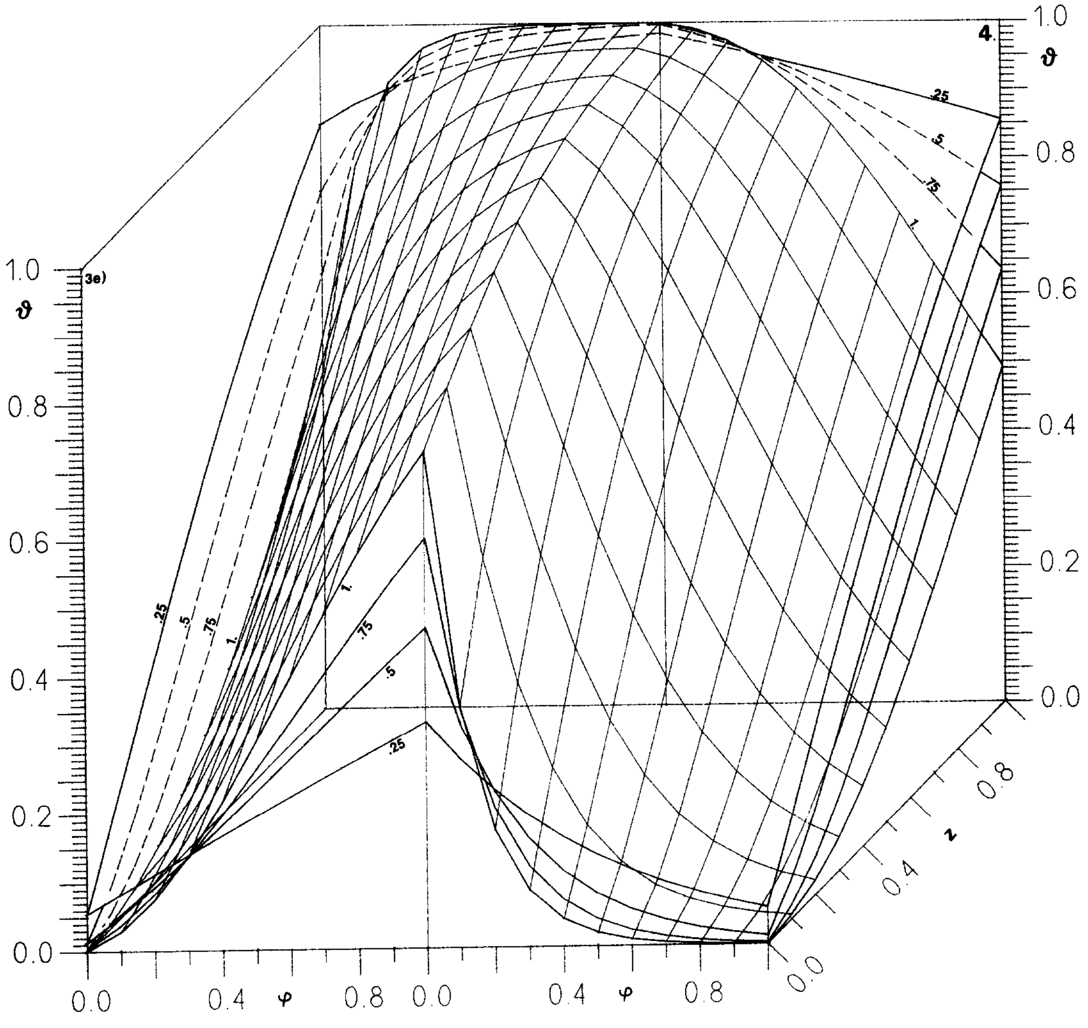


Fig. 3(e).

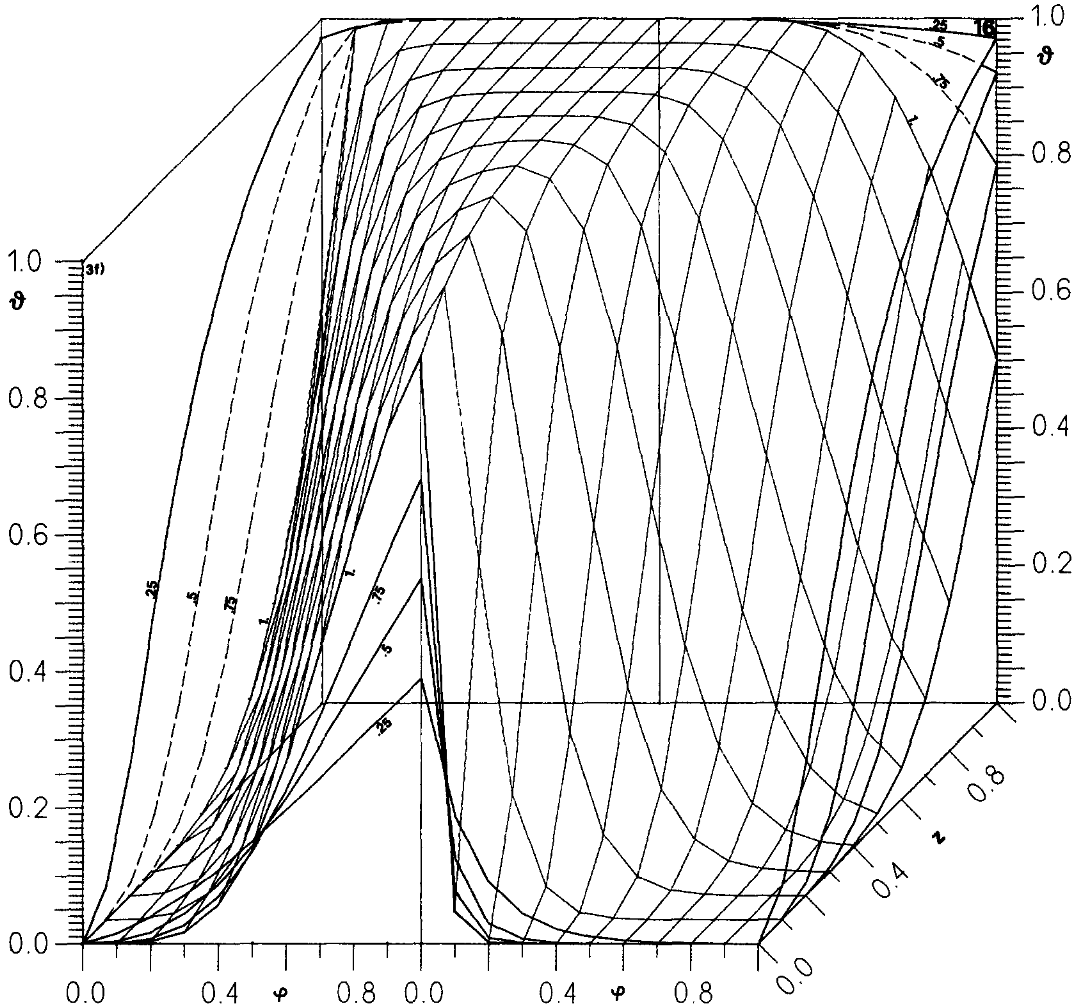

1.0
0.8
0.6
0.4
0.2
0.0
ϑ
3f)
.25
.5
.75
1.
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
0.0
0.4
0.8
z
1.0
0.8
0.6
0.4
0.2
0.0
16

FIG. 3(f).

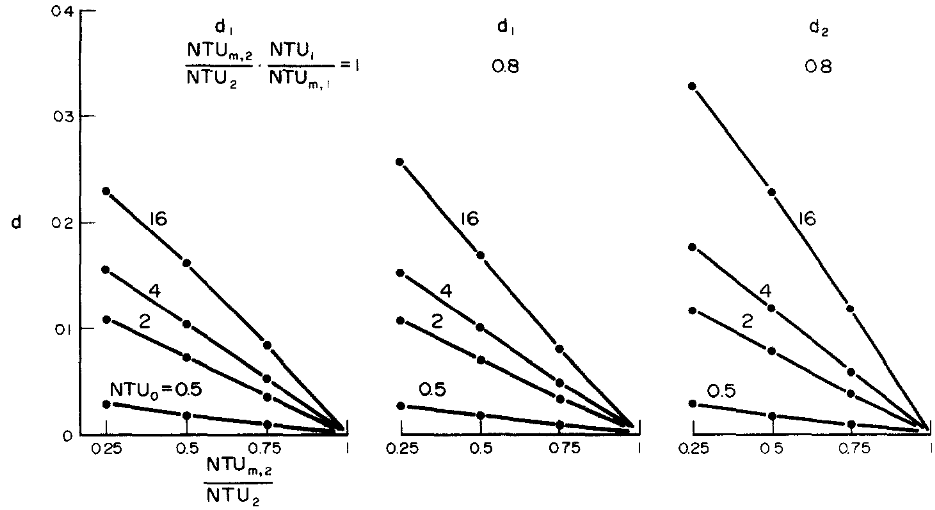


FIG. 4. Effect of $NTU_{m,2}/NTU_2$, NTU_o and $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ values on the distance d_j between the gas temperature fields in a rotary heat exchanger where $NTU_2/NTU_1 = 1$ (thermal conduction excluded).

mulas:

for the gas temperature fields in the jth zone

$$d_j = \left(\int_0^1 \int_0^1 [\theta_j(\varphi, z)|_{NTU_{m,2}/NTU_2=1} - \theta_j(\varphi, z)|_{NTU_{m,2}/NTU_2 \neq 1}]^2 \, dz \, d\varphi\right)^{1/2}; \quad (12)$$

for the matrix temperature fields

$$d_m = \left(\sum_{j=1}^{2} \int_0^1 \int_0^1 [\vartheta_j(\varphi, z)|_{NTU_{m,2}/NTU_2=1} - \vartheta_j(\varphi, z)|_{NTU_{m,2}/NTU_2 \neq 1}]^2 \, dz \, d\varphi\right)^{1/2} \quad (13)$$

where NTU_2/NTU_1, $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ and NTU_o are constant. The evaluation of the effect of the parameter values by means of defining the distance between temperature fields has an essential advantage because the distance does not depend on coordinates. Thus the effect can be simply presented as being dependent on the parameter values only. The results of computations according to equations (12) and (13) are presented in Figs. 4 and 5. As can be seen, the distance d changes as follows:

(a) the distances d_j and d_m are both approximately linearly dependent on the $NTU_{m,2}/NTU_2$ values;

(b) with small NTU_o values, the changes in the $NTU_{m,2}/NTU_2$ values cause only slight variations in the distance values;

(c) on the other hand, with large NTU_o values, changes in either the $NTU_{m,2}/NTU_2$ or $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ values have a marked effect on the distance values;

(d) it is seen that changes in the values of $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ ranging from 1 to 0.8 increase the distance values d_2 and d_m and that $d_2 > d_1$.

Finally, it can also be seen from Figs. 4 and 5 that the effect of $NTU_{m,2}/NTU_2$ or $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ values on the gas and matrix temperature distributions increases with an increase in NTU_o values.

3.1.2. *Effect of longitudinal matrix thermal conduction.* This effect was the subject of a previous paper [18], so only the new ideas and results of investigating this problem are presented here. The gas and matrix temperature distributions are shown in Figs. 6 and 7 according to the data in Table 2.

The effect of thermal conduction becomes greater as NTU_o values increase, and at large NTU_o values (see Figs. 6(c), (f) and 7(c), (f)) the longitudinal heat

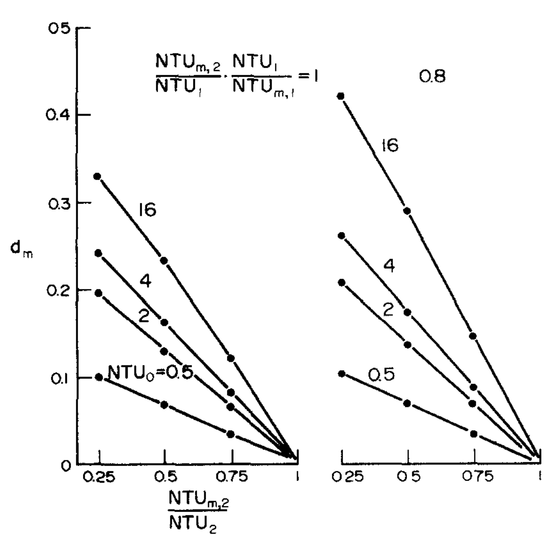
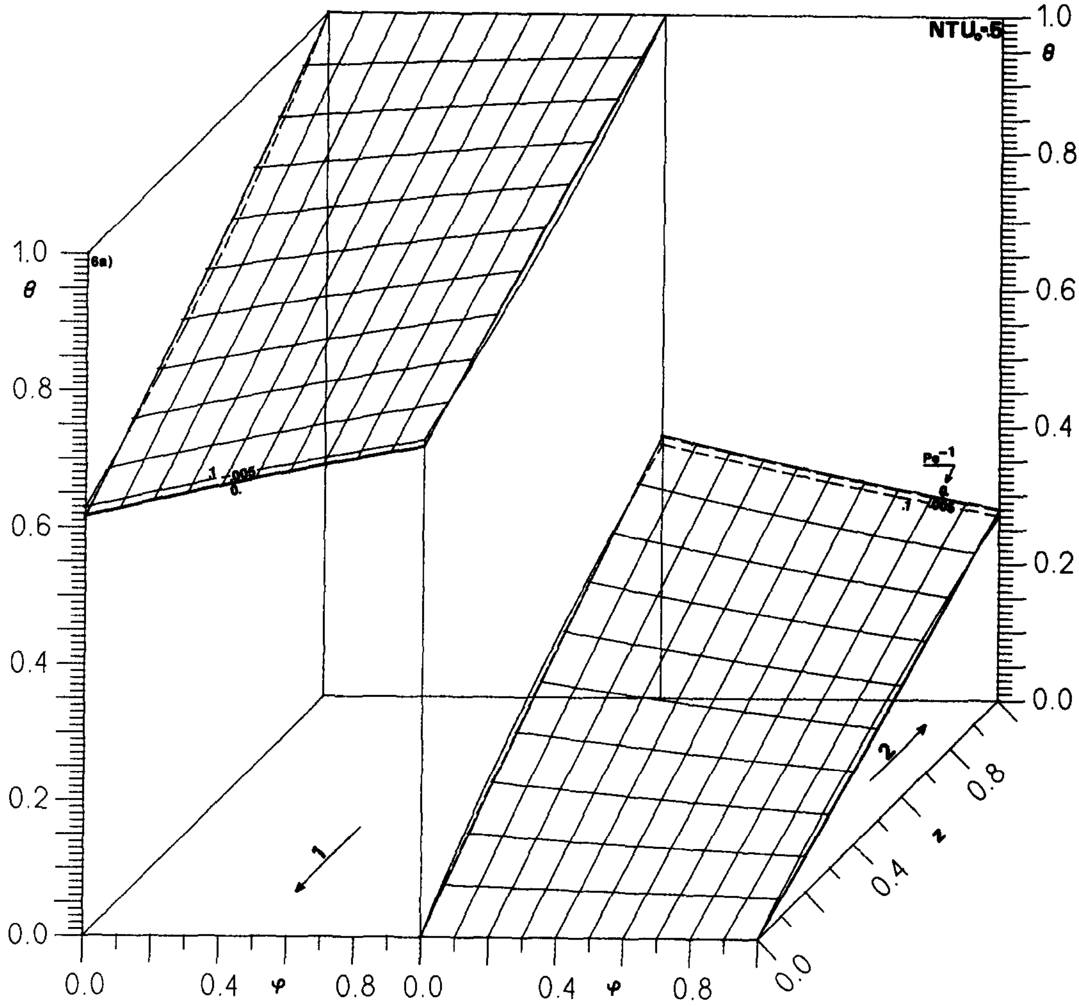


FIG. 5. Effect of $NTU_{m,2}/NTU_2$, NTU_o and $(NTU_{m,2}/NTU_2) \times (NTU_1/NTU_{m,1})$ values on the distance d_m between the matrix temperature fields in a rotary heat exchanger where $NTU_2/NTU_1 = 1$ (thermal conduction excluded).



(a)

FIG. 6. Effect of Pe^{-1} values, NTU_o values ((a), (b), (c) or (d), (e), (f)) and $(NTU_{m,2}/NTU_2)$ $(NTU_1/NTU_{m,1})$ ((a), (b), (c) equal to 1, (d), (e), (f) equal to 0.8) values on the gas temperature distributions in a rotary heat exchanger where $NTU_{m,2}/NTU_2 = 0.5$, $NTU_2/NTU_1 = 1$ (thermal conduction is taken into account).

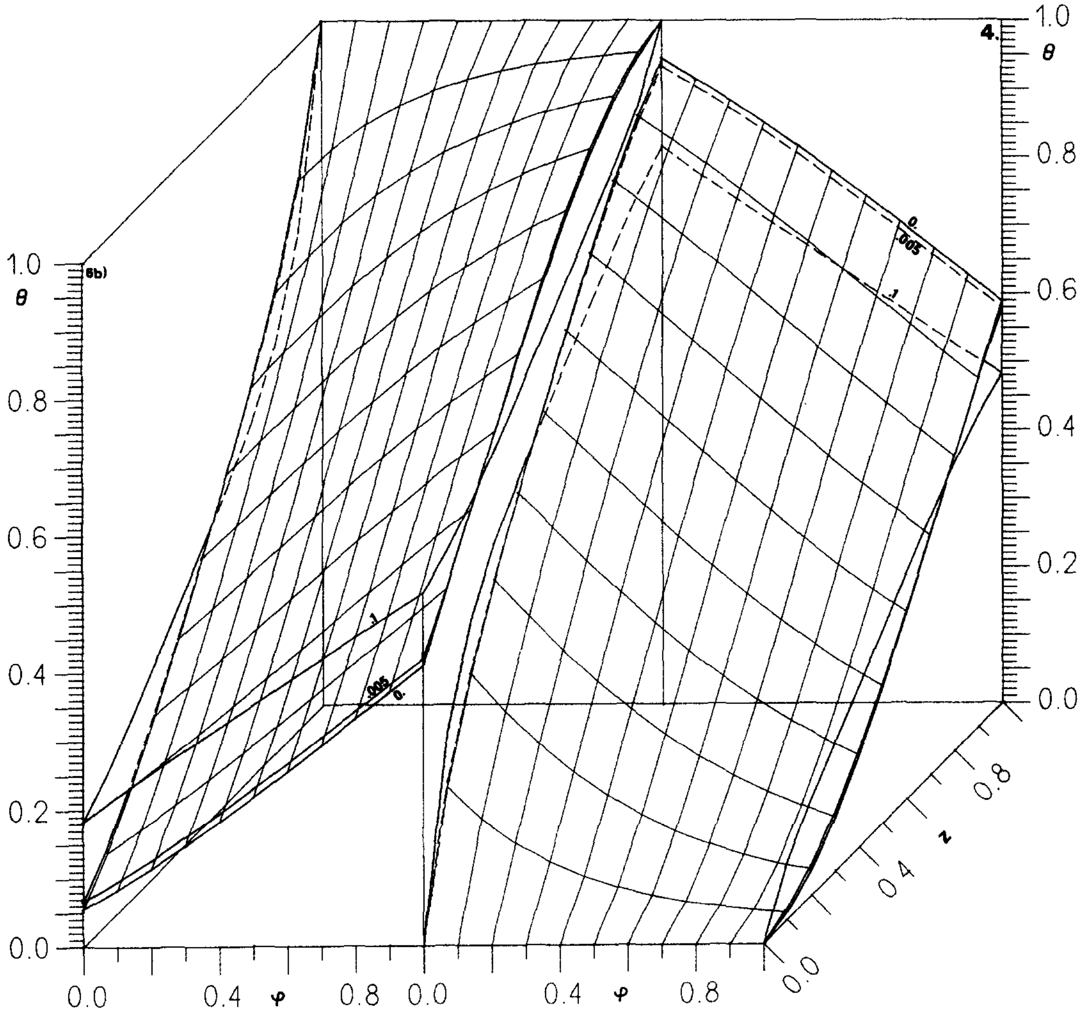


FIG. 6(b).

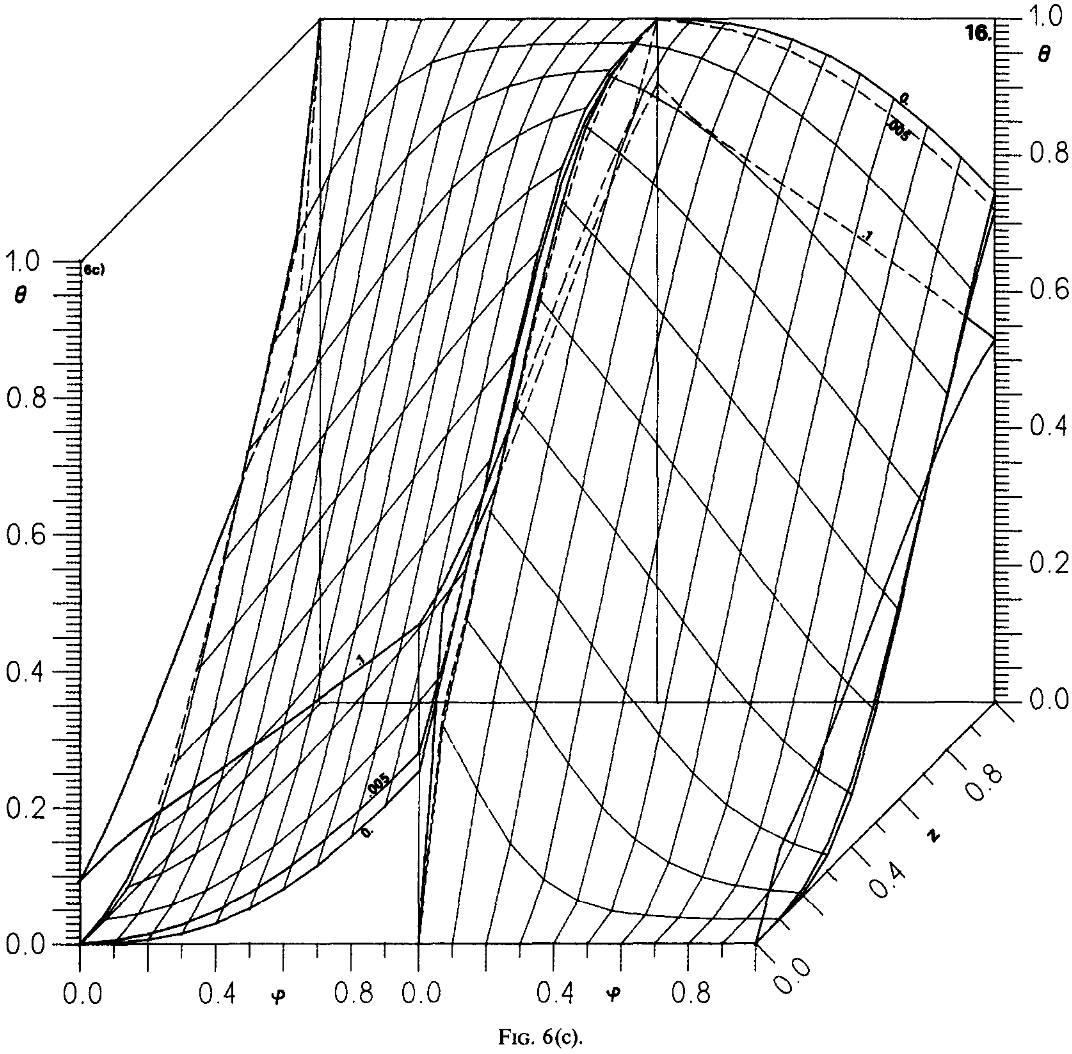


Fig. 6(c).

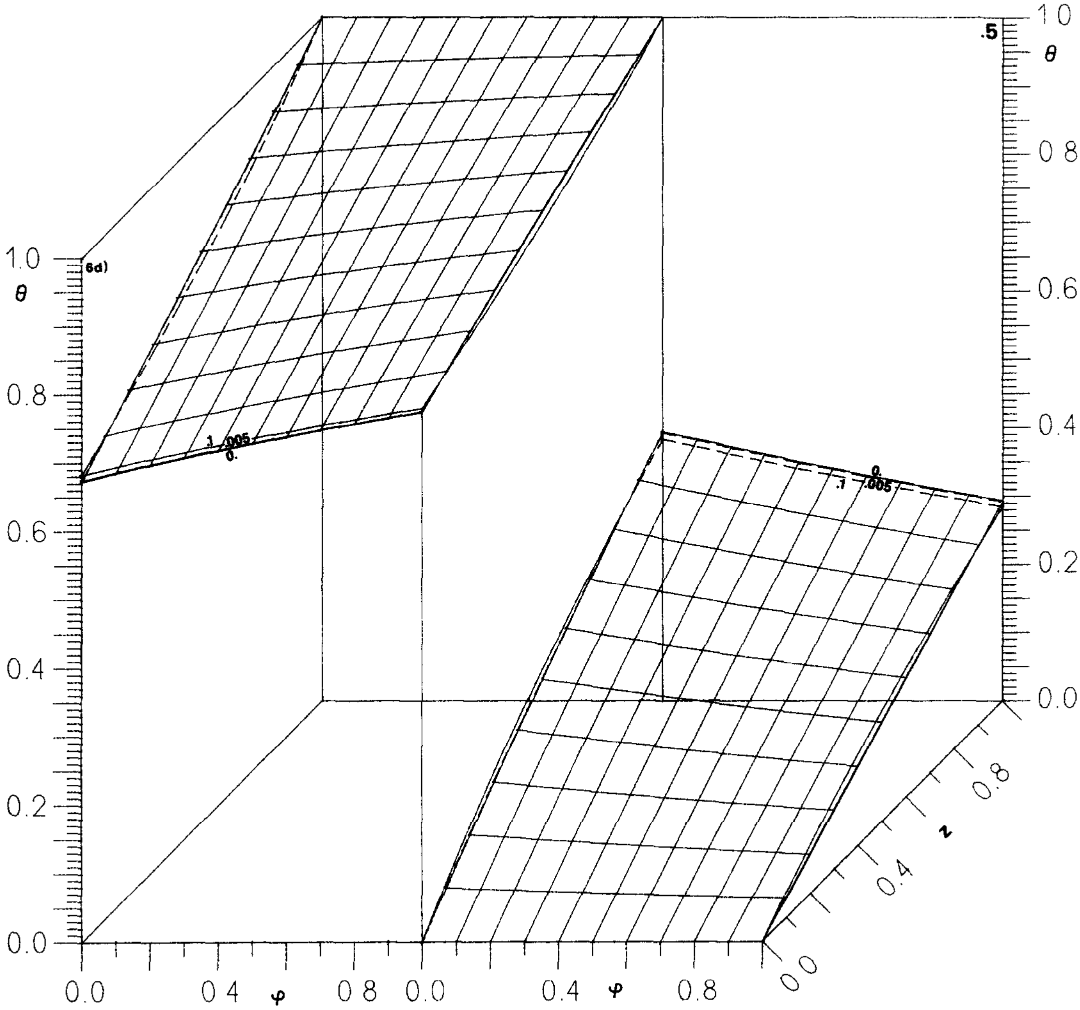

6d)
1.0
θ
0.8
0.6
0.4
0.2
0.0
.1
.005
0.
.5
0.8
0.6
0.4
0.2
0.0
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
0.0
0.4
z
0.8

FIG. 6(d).

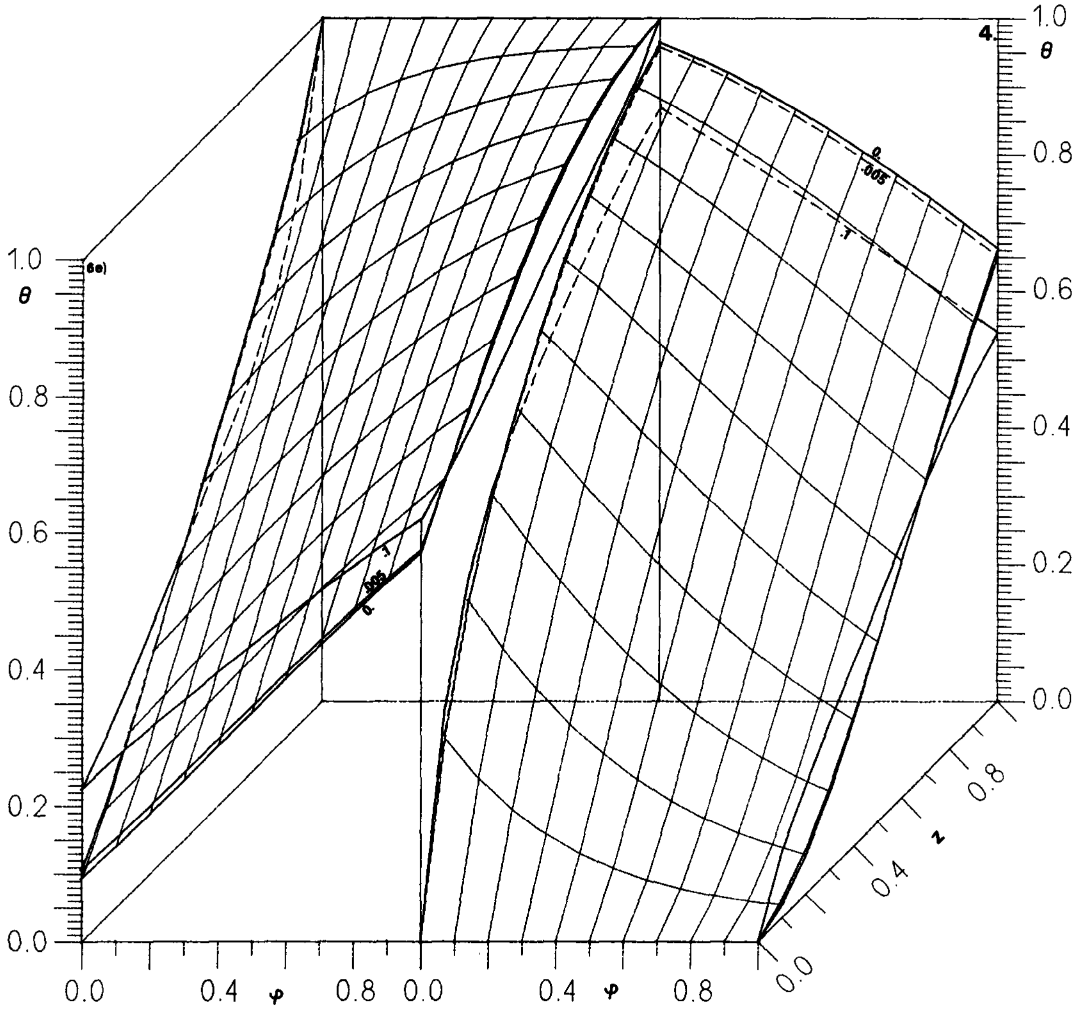


FIG. 6(e).

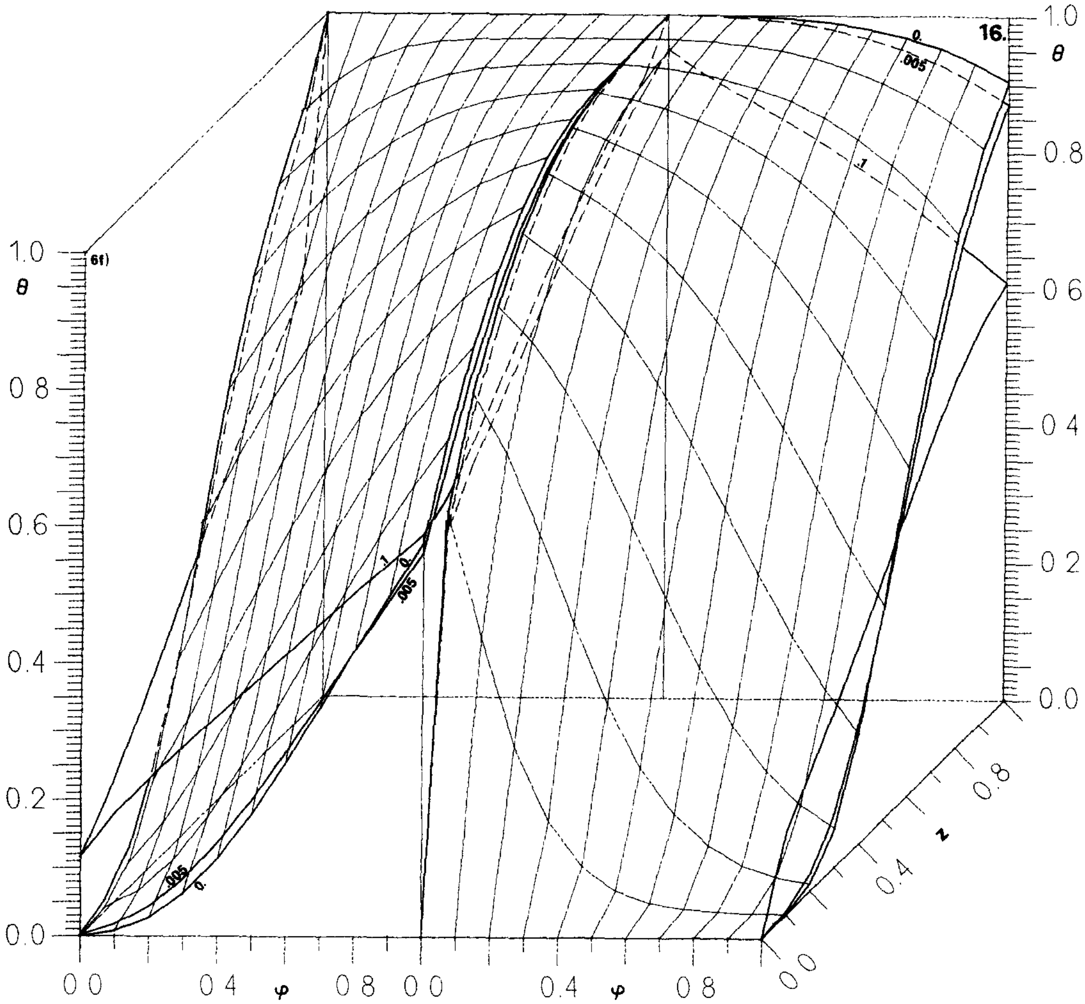
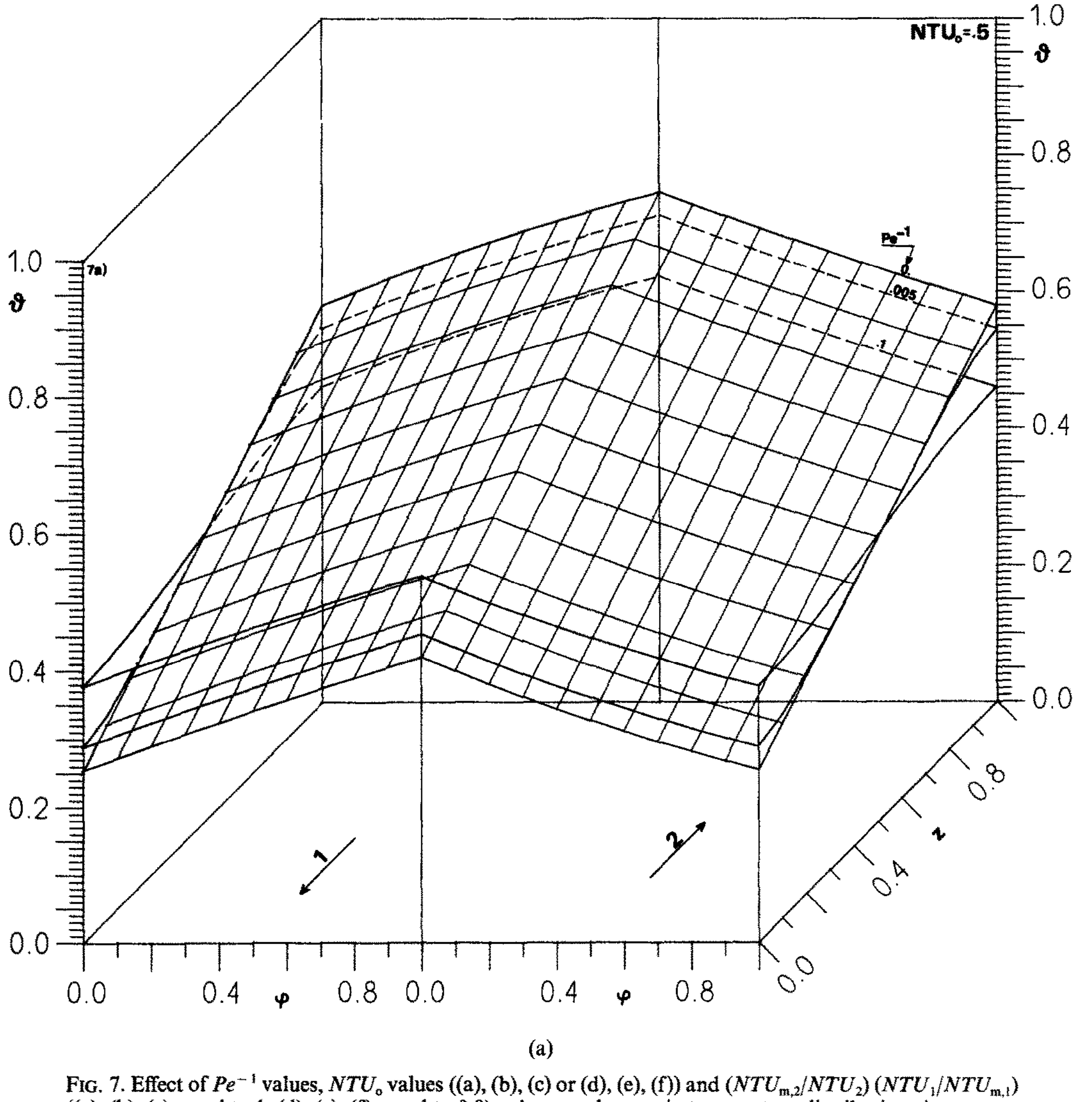


FIG. 6(f).



(a)

FIG. 7. Effect of Pe^{-1} values, NTU_o values ((a), (b), (c) or (d), (e), (f)) and $(NTU_{m,2}/NTU_2)$ $(NTU_1/NTU_{m,1})$ ((a), (b), (c) equal to 1, (d), (e), (f) equal to 0.8) values on the matrix temperature distributions in a rotary heat exchanger where $NTU_{m,2}/NTU_2 = 0.5$, $NTU_2/NTU_1 = 1$ (thermal conduction is taken into account).

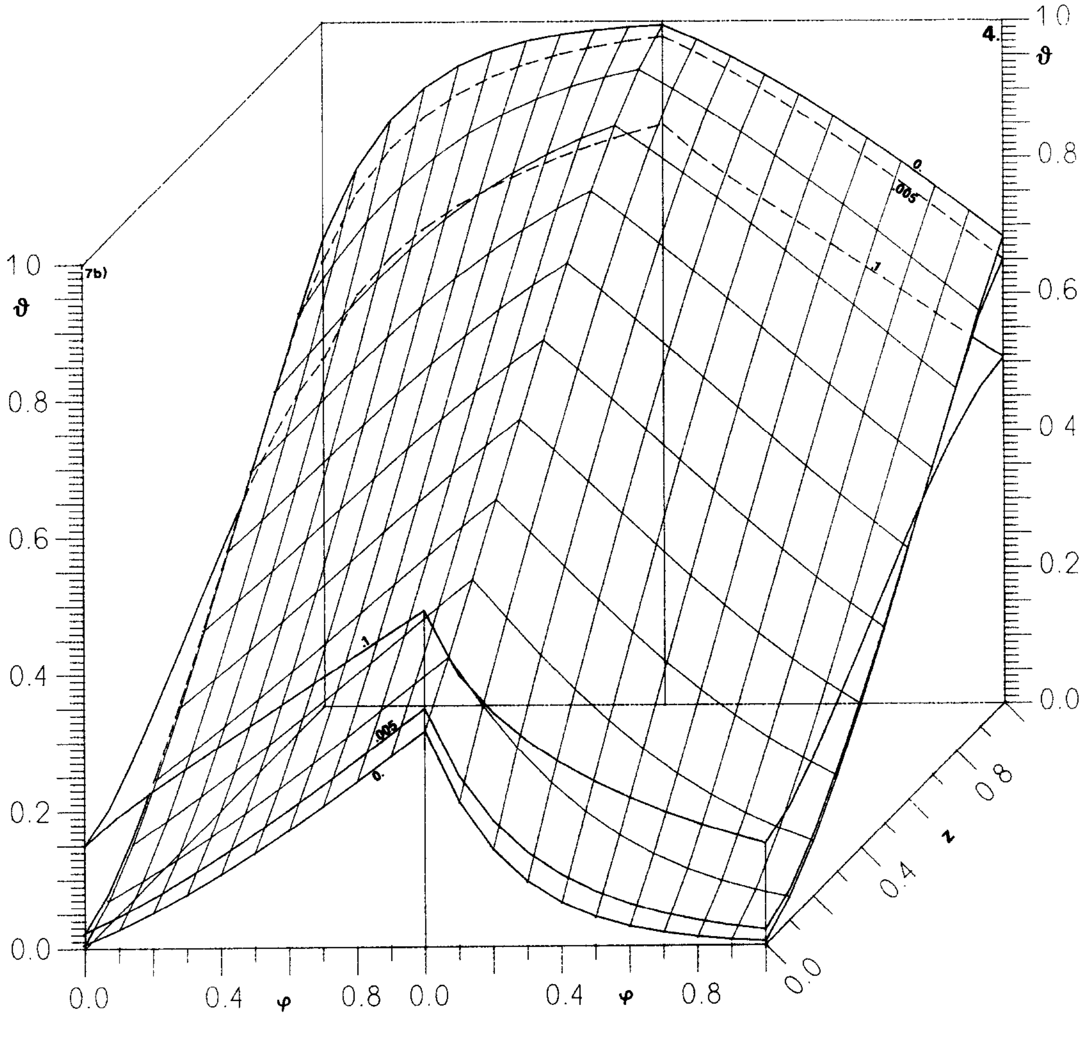


FIG. 7(b).

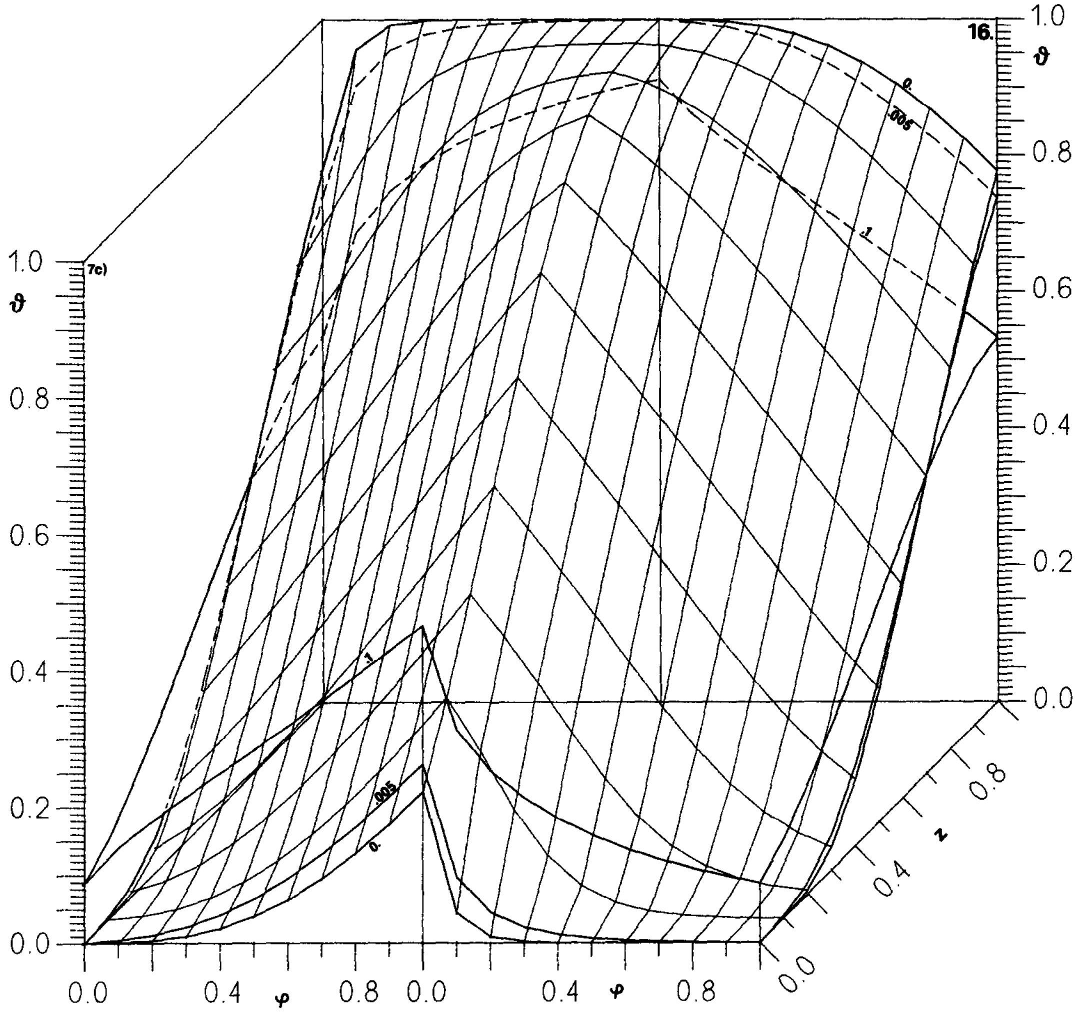

1.0
7c)
ϑ
0.8
0.6
0.4
0.2
0.0
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
0.0
0.4
z
0.8
1.0
16.
ϑ
0.8
0.6
0.4
0.2
0.0

FIG. 7(c).

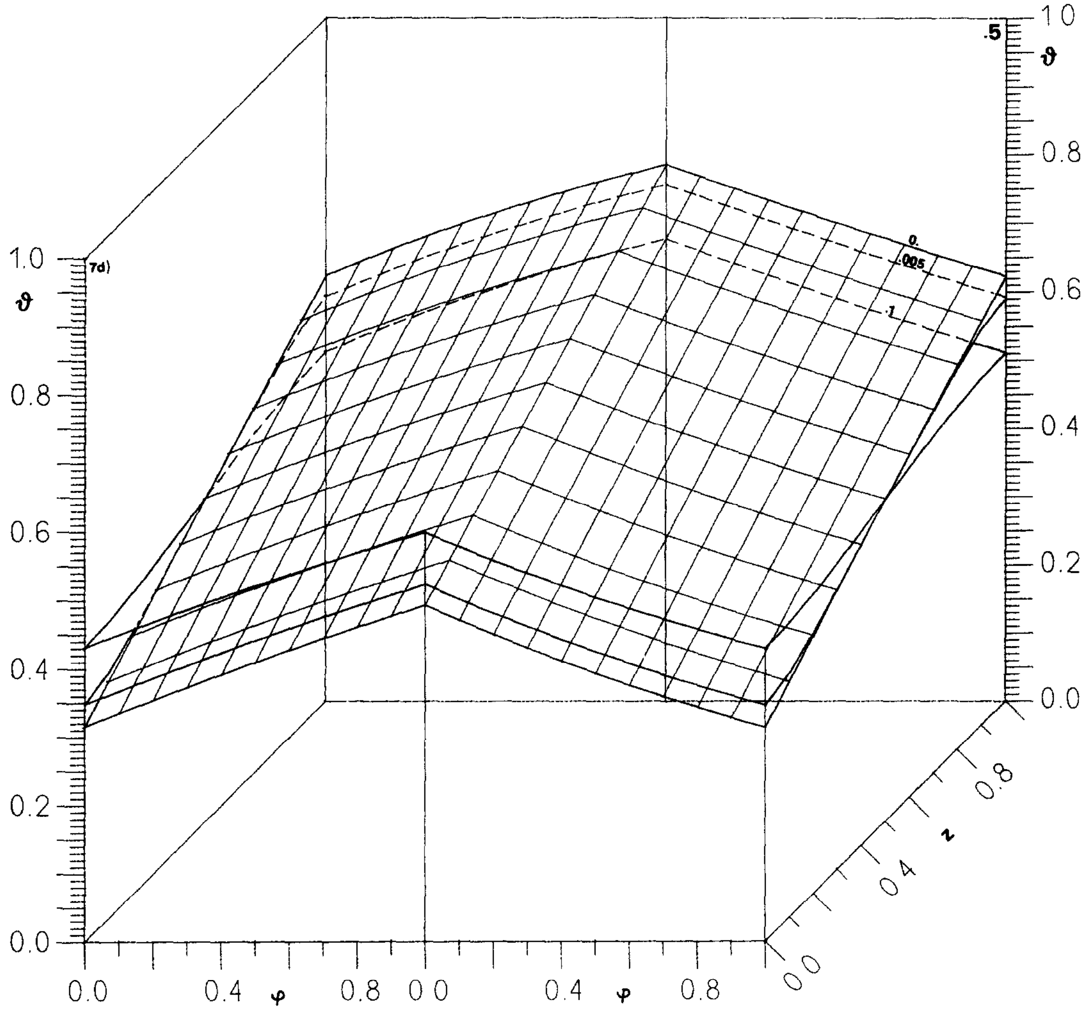


FIG. 7(d).

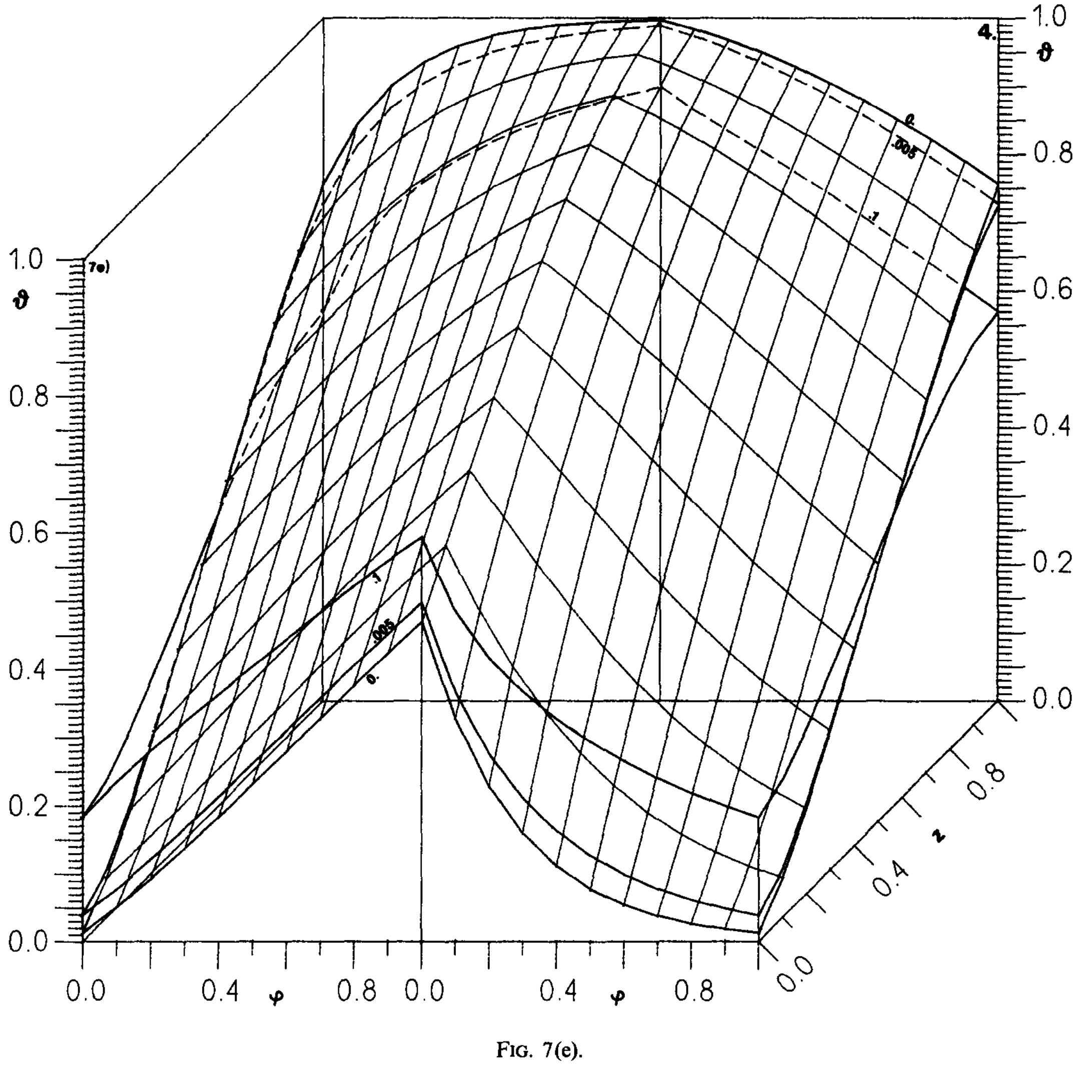


FIG. 7(e).

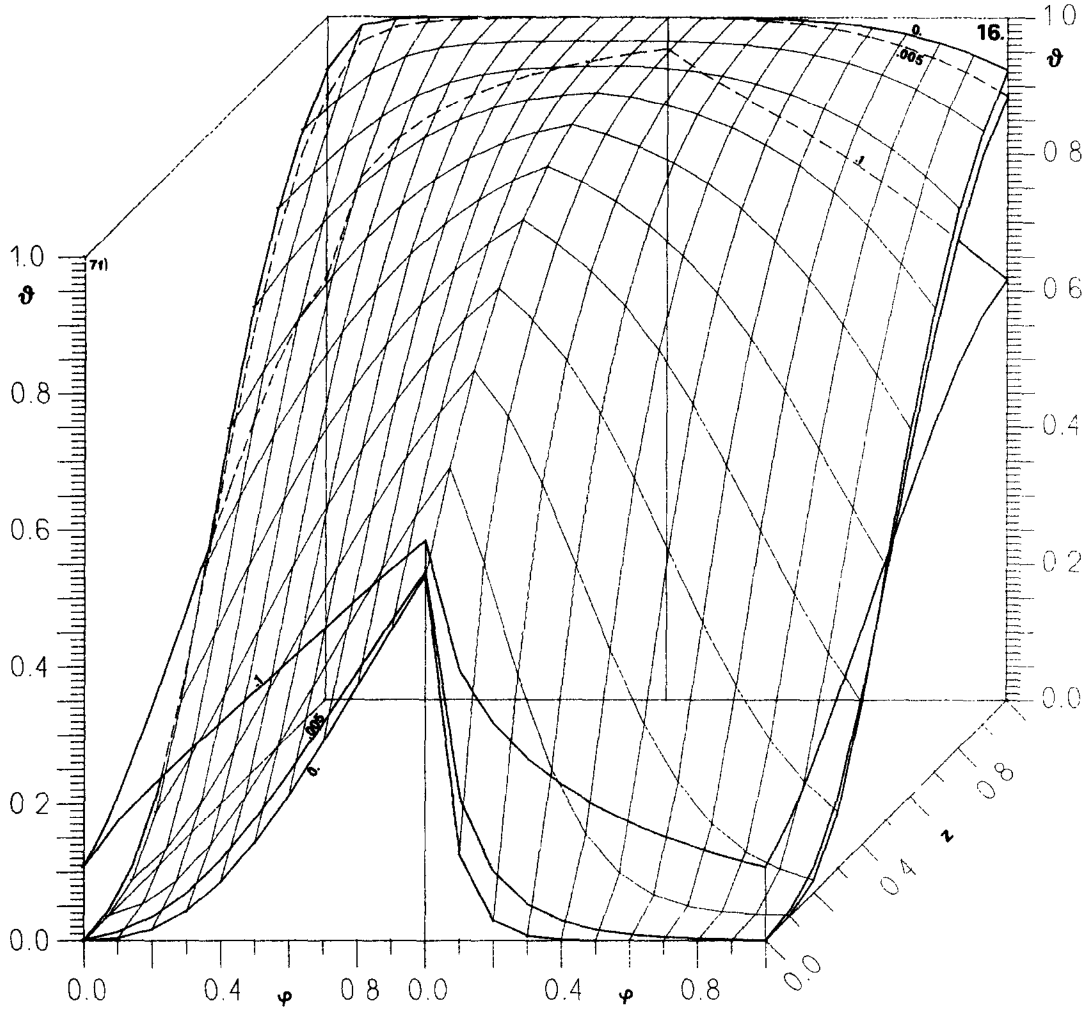

1.0
ϑ
0.8
0.6
0.4
0.2
0.0
71)
16.
0.
.005
.1
0.0
0.4
φ
0.8
0.0
0.4
φ
0.8
z
0.0
0.4
0.8
1.0
ϑ
0.8
0.6
0.4
0.2
0.0

FIG. 7(f).

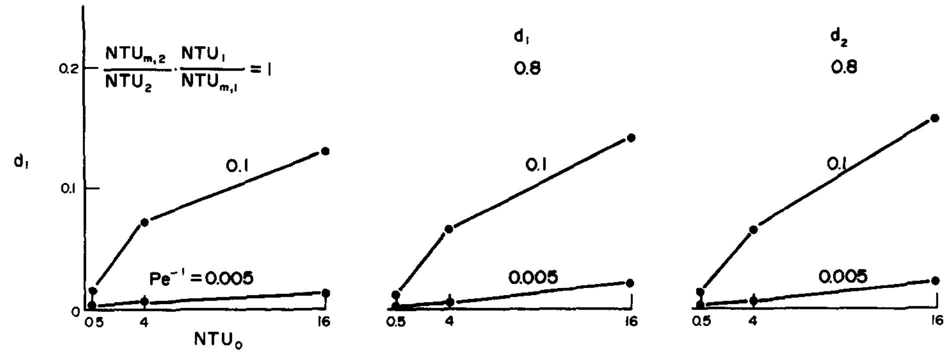


FIG. 8. Effect of Pe^{-1}, NTU_o and $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ values on the distance d_j between the gas temperature fields in a rotary heat exchanger where $NTU_{m,2}/NTU_2 = 0.5$, $NTU_2/NTU_1 = 1$ (thermal conduction is taken into account).

conduction causes essential changes in the gas and matrix temperature distributions. Hence, at the outlets of gas from the zones, the temperature distributions become approximately linear (at $Pe^{-1} = 0.1$) in the direction of the rotor rotation as compared to the case of disregarded heat conduction.

As is seen in Figs. 6(f) and 7(f) at $Pe^{-1} = 0$ and $Pe^{-1} > 0$ for $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1}) < 1$, the temperature distribution at the outlet of the heating zone may intersect.

As regards the effect of longitudinal thermal conduction on the gas and matrix temperature distributions, its values were evaluated numerically as before by means of the distance between temperature fields. For this purpose, the formulas presented in ref. [18] were employed at $NTU_{m,2}/NTU_2 = 0.5$ with values of NTU_o ranging from 0.5 to 16 and values of $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ ranging from 1 to 0.8. The results are shown in Figs. 8 and 9.

It is seen from these figures that for $Pe^{-1} = 0.005$, the distance values d_j and d_m increase slightly with an increase in NTU_o values. A considerable increase in the distance values with NTU_o values is evident for $Pe^{-1} = 0.1$, and furthermore the increase tends to fall with an increase in NTU_o values.

The effect of the $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ values ranging from 1 to 0.8 on d_j and d_m values, where $Pe^{-1} = 0.005$, is not significant. A marked increase in the distance values appears where $Pe^{-1} = 0.1$ for $NTU_o = 16$, and also $d_2 > d_1$.

4. GENERAL REMARKS

The numerical experiments reported in this paper are concerned with the effect of the parameter values in the ranges presented in Tables 1 and 2 on the temperature fields in a rotary heat exchanger. Among other conclusions, it has been found that the gas and matrix temperature distributions in relation to the parameter values can be approximately linear or strongly nonlinear in both the direction of the gas flow and the direction of rotation. On the other hand, the longitudinal heat conduction in the matrix has a definite influence on the temperature distributions, and reduces the nonlinearities, especially where the Pe^{-1} and NTU_o values are large.

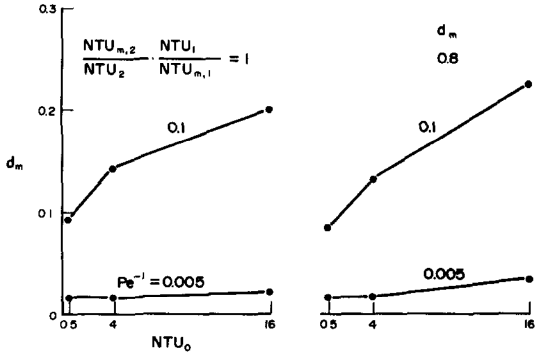


FIG. 9. Effect of Pe^{-1}, NTU_o and $(NTU_{m,2}/NTU_2)(NTU_1/NTU_{m,1})$ values on the distance d_m between the matrix temperature fields in a rotary heat exchanger where $NTU_{m,2}/NTU_2 = 0.5$, $NTU_2/NTU_1 = 1$ (thermal conduction is taken into account).

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APPENDIX. DENOTATION OF THE PARAMETERS USED IN THIS PAPER AS COMPARED WITH THAT OF ROMIE [11]

This paper	Romie [11]
NTU_1	N_b
NTU_2	N_a
NTU_2/NTU_1	N_a/N_b
$\frac{NTU_{m,2}}{NTU_2}\frac{NTU_1}{NTU_{m,1}}$	$\frac{(wct)_a}{(wct)_b}$
$NTU_{m,2}/NTU_2$	$\frac{(wct)_a}{WC}$
$NTU_o = \left[\frac{1}{NTU_2} + \left(\frac{NTU_{m,2}}{NTU_2}\frac{NTU_1}{NTU_{m,1}}\right)\frac{1}{NTU_1}\right]^{-1}$	$N_{tu} = \left[\frac{1}{N_a} + \frac{(wct)_a}{(wct)_b}\frac{1}{N_b}\right]^{-1}$
fluid 1	fluid b
fluid 2	fluid a

EFFETS DES VALEURS DES PARAMETRES SUR LES CHAMPS DE TEMPERATURE DU GAZ ET DE LA MATRICE DANS DES ECHANGEURS DE CHALEUR ROTATIFS

Résumé—On présente deux variantes de modèle lié au mécanisme de transfert d'énergie dans un échangeur de chaleur rotatif: l'un exclut et l'autre inclut la conduction thermique longitudinale dans la matrice. Les systèmes d'équations correspondants sont résolus par des méthodes analytiques et les résultats des calculs sont donnés graphiquement. A partir de ces solutions, on évalue l'effet des paramètres sur les champs de température dans le gaz et dans la matrice.

PARAMETEREINFLÜSSE AUF DIE GAS- UND TEMPERATURVERTEILUNG IN DREHENDEN WÄRMETAUSCHERN

Zusammenfassung—Zwei Modellvarianten für den Energietransport in einem drehenden Wärmetauscher werden vorgestellt: eine mit und ohne Längswärmeleitung in der Matrix. Die Gleichungssysteme für die Energiebilanz, welche die obengenannten Modelle beschreiben, wurden mit Hilfe analytischer Methoden gelöst, die Ergebnisse der Berechnungen werden grafisch dargestellt. Damit werden die Parametereinflüsse auf die Gas- und Temperaturverteilung ausgewertet.

ВЛИЯНИЕ ЗНАЧЕНИЙ ПАРАМЕТРОВ НА ТЕМПЕРАТУРНЫЕ ПОЛЯ ГАЗА И МАТРИЦЫ В РОТАЦИОННЫХ ТЕПЛООБМЕННИКАХ

Аннотация—Представлены два варианта модели, описывающих перенос энергии в ротационном теплообменнике: одна без учета продольной теплопроводности матрицы и вторая с её учетом. Соответствующие этим моделям системы уравнений баланса энергии решены аналитическими методами, и результаты расчетов представлены графически. На основе полученных решений оценено влияние значений параметров на температурные поля газа и матрицы.