4.2. Selecting a Change Nut

Calculate the dynamic permissible thrust (F) or dynamic permissible torque (T) and the pV value as a measuring stick for selecting a change nut. For details, see the section "Selecting a Nut" on page M-7.
The "p" and "V" values required to obtain the pV value of the change nut are calculated from the following equations.

Calculating the Contact Surface Pressure p

The value of "p" is obtained as followed.
●If an axial load is applied:

$$p = \frac{P_F}{F} \times 9.8$$

where

p : Contact surface pressure on the teeth from an axial load (P_F N) (N/mm²)
F : Dynamic permissible thrust (N)
P_F : Axial load (N)

●If a torque is applied:

$$p = \frac{P_T}{T} \times 9.8$$

where

p : Contact surface pressure on the teeth from a load torque (P_T N-m) (N/mm²)
T : Dynamic permissible torque (N-m)
P_T : Load torque (N-m)

Calculating the Sliding Speed V on the Teeth

The value of "V" is obtained as followed.

$$V = \frac{\sqrt{2} \cdot \pi \cdot Do \cdot n}{10^3}$$

where

V : Sliding speed (m/min)
Do : Effective diameter (mm)
(See the corresponding dimensional table in the "THK General Catalog - Product Specifications," provided separately.)
n : Rotation speed per minute (min^{-1})
R : Lead (mm)

[Example of calculation]

Assuming that Change Nut model DCMB is used, select a screw nut that travels at feed speed S = 10 m/min while receiving an axial load P_F = 1,760 N accompanied by vibrations.
First, tentatively select model DCMB25T (dynamic permissible thrust F = 12,700 N).
Obtain the contact surface pressure (p).

$$p = \frac{P_F}{F} \times 9.8 = \frac{1760}{12700} \times 9.8 \fallingdotseq 1.36\ N/mm^2$$

Obtain the sliding speed (V).
The rotation speed per minute (n) of the screw shaft needed to move it at feed speed S = 10 m/min is calculated as follows.

$$n = \frac{S}{R \times 10^{-3}} = \frac{3}{73.3 \times 10^{-3}} \fallingdotseq 136 min^{-1}$$

$$V = \frac{\sqrt{2} \cdot \pi \cdot Do \cdot n}{10^3} = \frac{\sqrt{2} \times \pi \times 23.1 \times 136}{10^3} \fallingdotseq 14.0\ m/min$$

From the diagram of pV values (Fig. 2) on page M-7, it is judged that there will be no abnormal wear if the sliding speed (V) is 16 m/min or below against the "p" value of 1.36 N/mm^2.

Second, obtain the safety factor (f_S) against the dynamic permissible thrust (F). Given the service conditions:
Temperature factor f_T = 1, and
Applied load P_F = 1,760 N, the safety factor is calculated as follows.

$$f_S \leqq \frac{f_T \cdot F}{P_F} = \frac{1 \times 12700}{1760} = 7.2$$

Since the required strength will be met if "f_S" is at least 4 because of the type of load, it is appropriate to select model DCMB25T.