Efficiency and Thrust

The efficiency (η) at which the screw transfers a torque into thrust is obtained from the following equation.

$$\eta = \frac{1 - \mu\tan\alpha}{1 + \mu/\tan\alpha}$$

η : Efficiency
α : Lead angle
μ : Frictional resistance

Fig.4 shows the result of the above equation.
The thrust generated when a torque is applied is obtained from the following equation.

$$Fa = \frac{2 \cdot \pi \cdot \eta \cdot T}{R \times 10^{-3}}$$

Fa	: Thrust generated	(N)
T	: Torque (input)	(N·m)
R	: Lead	(mm)

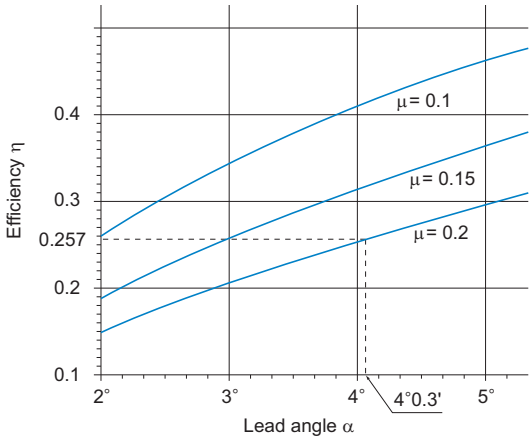

Fig.4 Efficiency

Example of thrust force calculation

Assuming that Lead Screw Nut model DCM20 is used and the input torque T = 19.6 N·m, obtain the thrust to be generated.
Calculate the efficiency (η) when μ = 0.2.
The lead angle (α) of model DCM20: 4°03'
From the diagram in Fig.4, the efficiency (η) when the friction coefficient μ = 0.2 is obtained as η = 0.257.
Obtain the thrust generated.

$$Fa = \frac{2 \cdot \pi \cdot \eta \cdot T}{R \times 10^{-3}} = \frac{2 \times \pi \times 0.25 \times 19.6}{4 \times 10^{-3}} \fallingdotseq 7700\ \text{N}$$