Motor Load Calculations

Analysis for the motion

$Motor\ Provided:\ 12V\ DC$

$Motor\ Specifications-\ Max\ Speed: 30RPM\ , Max\ Torque: I\ Nm$

$Load\ (m)$

$=\ Mass=\ Volume\ of\ load*\ Density$

$Volume = 3.63 \times 10^{-4} m^3$

$Density = 7700 Kg/m^3$

$Mass\ =\ 2.7951\ kg\ =\ 2.8kg\ (approx)$

$Friction\ coeff.\ between\ load\ and\ guide=\ O$

$(Rolling\ friction\ is\ approximately\ =\ 0)$

Screw specifications:

$Diameter: 10mm$

$Length:\ 350mm$

$Material\ density:\ 0.62\ kg/m\quad (for\ M.S.\ Rod\ .1\ Omm)$

$Pitch:\ 1.5mm/rev$

Load inertia $(J)\ =$

$$Load \times (\frac{pitch}{2\pi})^2 + \frac{\pi}{32} \times (screw-density) \times (screw-length) \times (screw-diameter)^4$$

$$=\ 0.159\ kg\ m^2$$

Acceleration torque ;

$Where\ V\ =\ Velocity\ of\ screw\ in\ r/min\ and\ ta\ =\ time\ of\ acceleration/deceleration$

$$Ta = \frac{(J \times V)}{9.55 \times ta}$$

$V\ =\ 30rpm\ (assume\ max)\ and\ ta\ =\ Isec$

$Ta = O.4995Nm$

$Load\ Torque \approx 0$

Hence our ***net torque***:

$T = (Ta + Tl) \times FOS$

$FOS = 2(recommended)$

$T = 0.4995 \times 2$

$Total\ Torque = 0.999\ \approx 1Nm$

$1Nm < 2Nm$

Hence our motor is expected to work