SCREW JACK SELECTION

5 Step Guide

POWER JACKS

1. Five Step Guide to Initial Screw Jack Selection

The following selection procedure is applicable for Machine and Ball Screw Jacks.

Calculate Power and Torque Requirements

Select a Screw Jack from the tables with adequate load carrying capacity and note the Screw jack static and dynamic efficiency for required input speed.

Step 1 - Screw Jack Input Speed

$$N\ (rpm) = \frac{\text{Raise Rate (mm/min) *Gear Ratio}}{\text{Pitch (mm) * N° of Starts on Lifting Screw}}$$

Note Screw Jack Input speed should not exceed 1800 rpm.

Step 2 - Operating Input Power (kW), P_{in}

$$P_{in}(kW) = \frac{\text{Load (kN) * Raise Rate (mm/min)}}{60000 * \eta ad}$$

ηad = Dynamic Screw Jack Efficiency

Step 3 - Operating Input Torque

$$T_{ino}\ (Nm) = \frac{P_{in}\ (kW) * 9550}{N\ (rpm)}$$

Step 4 - Screw Jack Start-Up Torque

$$T_{ins} = \frac{\text{Load (kN) * Pitch (mm) * N° of Starts on Lifting Screw}}{2 * \pi * \eta as * \text{Gear Ratio}}$$

ηas = Static Screw jack Efficiency

Step 5 - Mechanical Power and Torque Check

Check whether the Screw Jack power and torque required for the application is not greater than the maximum allowable mechanical input power ($P_{mechanical}$) and Start-Up Torque at Full Load (T_s) values specified in the Screw Jack performance tables.

If Pmechanical > P_{in} & T_s > T_{ins} then the Screw Jack selected is acceptable for power requirements.

2. Example Selection

Application Constraints

- **Load on Screw Jack = 15 kN in Tension**
- **Raise Rate required = 100 mm/min**

Consider all application constraints then choose a Screw Jack that looks suitable for the application with a load rating equal to or greater than the maximum working load. For this example say a 25 kN Sym-metric Screw Jack (refer 1.2.1.) with translating screw, 6:1 gear ratio, single start lifting screw (6 mm lead).

Calculate Power and Torque Requirements

Step 1 - Screw jack Input Speed

$$\text{N (rpm)} = \frac{100\ (\text{mm/min}) * 6\ (\text{Gear Ratio})}{6\ (\text{mm}) * 1\ (\text{N° of starts on Lifting Screw})}$$

N = 100 rpm

Note Screw Jack Input Speed should not exceed 1800 rpm.

Step 2 - Operating Input Power (kW), P_{in}

$$P_{in}(\text{kW}) = \frac{15\ (\text{kN}) * 100\ (\text{mm/min})}{60000 * 0.275}$$

P_{in} = 0.091 kW

Step 3 - Operating Input Torque

$$T_{ino}\ (\text{Nm}) = \frac{0.091\ (\text{kW}) * 9550}{100\ (\text{rpm})}$$

T_{ino} = 8.7 Nm

Step 4 - Screw Jack Start-Up Torque

$$T_{ins} = \frac{15\ (\text{kN}) * 6\ (\text{mm}) * 1\ (\text{N° of starts on Lifting Screw})}{2 * \pi * 0.208 * 6\ (\text{Gear Ratio})}$$

T_{ins} = 11.5 Nm

η_{as} = 0.208 (refer 1.2.1.1)

Step 5 - Mechanical Power and Torque Check

Find the Screw jacks mechanical power and torque rating from the performance data tables (refer 1.2.1.1.)

$P_{mechanical}$ = 1.5 kW > P_{in} and T_s = 19 Nm > T_{ins}

Therefore the Screw jack selected is suitable for application for initial constraints tested, further analysis may be required to ensure the Screw Jack is suitable for all application conditions (refer 1.1.3.1. or consult Power Jacks Ltd).

POWER JACKS

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