SELECTING A CNR CLUTCH BRAKE

The torque capacity (T_{cat}) for the CNR clutch brake as listed in the table is applicable only for steady state conditions. However the CNR clutch brake is generally used in applications where the input shaft is rotating continuously while the output shaft is intermittently accelerated to full speed upon command. This application, where suddenly applied dynamic loads are transmitted, can cause clutch failures from dynamic overloads. Therefore, in selecting a clutch brake for a particular application, the steady state torque as well as the kinetic energy factor **(KEF)** must be taken into account. The following example explains the selection of a CNR clutch brake for a typical industrial application.

EXAMPLE

A shaft is to be accelerated from rest to 250 RPM by means of a CNR clutch brake. The moment of Inertia (I_L) for the driven load is 8000×10^{-6} in.-lb.-sec^2. The friction torque of the system (T_f) is measured to be 30 lb.-in.

For this case the merits of a CNR-12 and a CNR-20 will be evaluated.

1. Determine the kinetic energy change (KEC) experienced by the clutch output when accelerating from rest to 250 RPM.

$$KEC = 1/2\ (I_L + I_{cat})\omega^2$$

Where:

$$\omega^2 = (250\ RPM \times 2\pi/60)^2$$

$$= 685\ (Radians/Sec)^2$$

For the CNR-12 Clutch Brake:

$$KEC = 1/2\ (8000 + 500) \times 10^{-6}\ (685)$$
$$= 2.91\ lb.\text{-}in.$$

For the CNR-20 Clutch Brake:

$$KEC = 1/2\ (8000 + 900) \times 10^{-6}\ (685)$$
$$= 3.05\ in.\text{-}lbs$$

2. Adjust the kinetic energy factor (AKEF) of the clutch for the friction torque of the system.

$$T_A = (T_{cat} - T_f)$$

T_A = Acceleration torque, lb.-in.

$$AKEF = KEF \times (T_A / T_{cat})^2$$

For the CNR-12 Clutch Brake;

$$T_A = (125 - 30) = 95\ lb.\text{-}in.$$

$$AKEF = 5 \times (95/125)^2 = 2.89\ lb.\text{-}in.$$

For the CNR-20 Clutch Brake;

$$T_A = (200 - 30) = 170\ lb.\text{-}in.$$

$$AKEF = 7.8 \times (170/200)^2 = 5.63\ lb.\text{-}in.$$

3. Compare the adjusted kinetic energy factors (AKEF) of the CNR-12 and the CNR-20 to their respective KEC values.

For the CNR-12 Clutch Brake;

AKEF = 2.89 lb.-in.
KEC = 2.91 lb.-in.

In this case the CNR-12 is marginally underated if used in a rigid system (ie. clutch driven by gears) since the **KEC > AKEF.**

For the CNR-20 Clutch Brake;
AKEF = 5.63 lb.-in.
KEC = 3.05 lb.-in.

In this case the CNR-20 clutch brake is better suited for the desired application than the CNR-12 when used in a rigid system. If a resilient coupling is used for driving the clutch, such as a belt, the kinetic energy factor of the clutch increases by virtue of belt compliance. In this case the CNR-12 may be suitable for the application.

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