

ECLIPSE SERVO MOTOR BRAKE ON GANTRY SYSTEM

In emergency stop situations, heavy loads need to be stopped safely and quickly in a controlled manner. These are the issues a major designer and builder of robotic gantry systems had when they came to NEXEN.

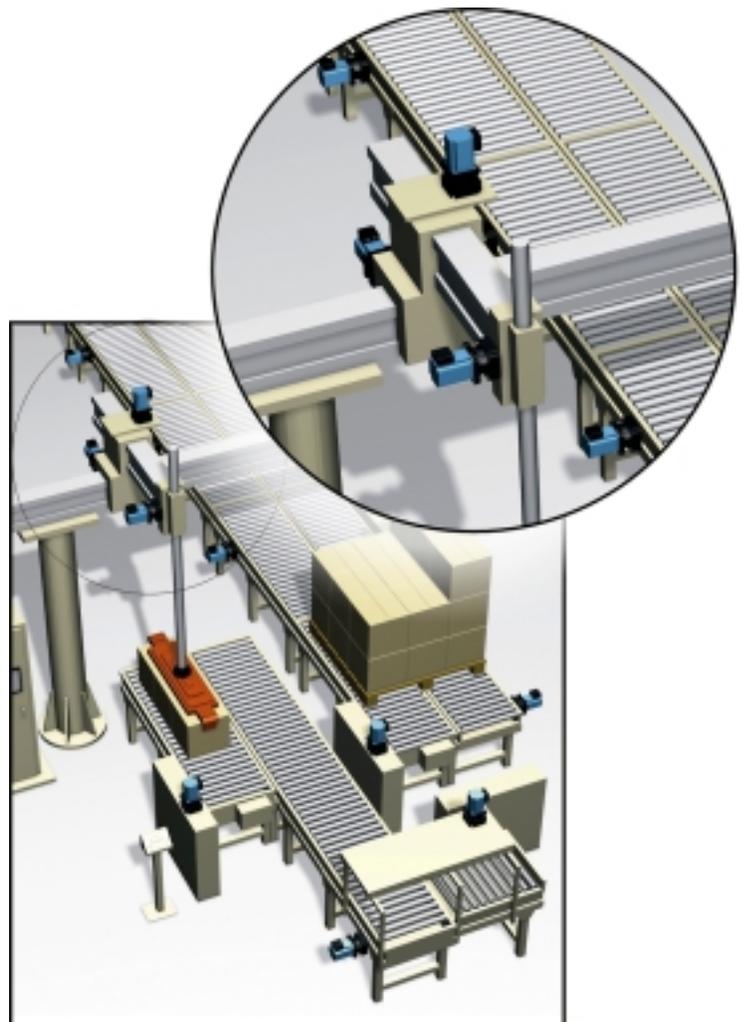
The customer manufacturers overhead “pick and place” robots and conveyor systems to move products throughout a factory. The robotic arm rides along the gantry system, picking up and stacking a variety of products onto pallets. The pallets are then moved along by a series of conveyors. The “pick” device (end effector) could be vacuum or mechanical in nature and operates in the X, Y and Z axes.

The customer was using electric brakes mounted between an Indramat motor and NEMA-flanged worm gear reducer. Prior to installation, the customer needed to modify each brake by designing special flanges to accept Indramat MKD112, MKD090 or MKD071 motors and mount onto a NEMA- flanged gear reducer. Additionally, these modified brakes could not absorb the energy produced by each stop and failed to perform adequately on subsequent stops.

Nexen was able to solve this company’s problem by installing the new Eclipse Servo Motor Brake. Eclipse utilizes a flange-mounted design that includes so many options it can fit virtually every servo motor. Out of the box, the Eclipse solution can be mounted between the servo motor and the NEMA-flanged, worm gear reducer on the lift and rail systems of the gantry robot. The output end of the size 4 & 5 Eclipse brakes are supplied with a NEMA shaft, pilot flange and bolt circle to mount directly to 56TC or 145TC worm gear reducer. Both input and output flanges have slotted bolt holes that allow easy bolt installation and provide a range of bolt circle diameters. These are ***standard products!***



Eclipse Servo Motor Brake



The markets served with this style of gantry material handling equipment include; Printing, Paper Converting, Textile, Glass, Plastic, Rubber, Tire and Roofing Material.

CUSTOMER EXAMPLE

The brake mounted between a servo motor and a 145TC-flanged gearbox is required to perform a dynamic stop of the gantry moving in the "X" axis, within (5) seconds. The 18 foot long gantry travels at 120 inches per second and carries a 3500 pound load. The driving/stopping forces are driven through a 40 tooth, 14mm pitch sprocket.



Brake Selection Calculations

Given: Gearbox Ratio= 12.19:1
Sprocket Diameter= 7.0 inches, 3.50 inch radius
Velocity= 120 feet per second or 10 feet per minute
Weight of loaded gantry= 3500 pounds
Required Stop Time= 5 seconds
Rated Brake Torque= 200 inch pounds

(1) Energy per Stop (E) = $\frac{1}{2} MV^2$

Mass (M) = $W/32.2$
W=Weight of the load
32.2=Acceleration of gravity

$M = 3500/32.2 = 109$ pounds
 $E = 1/2(109)10^2 = 5435$ lb.ft. squared

(2) Torque (Tgb) at the output side of the gearbox (Rated Brake Torque x Gearbox Ratio)

$Tgb = 200 \times 12.19 = 2438$ inch pounds

(3) Force (F) in pounds exerted on the drive sprocket (Torque (Tgb) at the output side of the gearbox divided by the Sprocket Radius)

$F = 2438/3.5 = 697$ pounds

(4) Stop Time (t) = Velocity (V) of the gantry divided by the Deceleration Rate (a) in feet per second squared

$a = 32.2 (F)/ W$
V = Velocity in feet per minute = 10
 $a = 32.2 (697)/ 3500 = 6.4$ fps squared
 $t = 10/6.4 = 1.6$ seconds

RECOMMENDED ECLIPSE SERVO MOTOR BRAKE

Size 4, 200 inch pound rated brake
Input Flange Data: Bolt Circle: 165 mm, Bore: 24mm
Output Flange and Shaft Data: NEMA 145TC

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In accordance with Nexen's established policy of constant product improvement, the specifications contained in this document are subject to change without notice. Technical data listed in this document are based on the latest information available at the time of printing and are also subject to change without notice. For current information, please consult www.nexengroup.com

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