



Custom Screw Lift

Custom "Screw" Lift provides safer ride, more controlled vertical movement of satellites at Boeing manufacturing facility in Los Angeles

Features and Benefits

Custom Screw Lift Design for Precise Movement

Industry Group: Vertical Reciprocating Conveyors



Screw Lift Travels 3 ft. with Precision

Milwaukee, Wisconsin (February 17, 2012) - Man made satellites orbit the earth at altitudes that can exceed 20,000 miles, typically transported by a rocket or space shuttle, the speed and path of which are precisely controlled in order to launch the satellite into the desired orbit. Satellites at this altitude orbit the earth at the same speed in which the earth turns, hovering over the same spot on the earth's surface at all times.

Precise movement is a way of life for satellites, and at a Boeing manufacturing facility just outside Los Angeles International Airport, the precision begins on the very first trip a completed satellite takes. The trip, all of three feet, is from the assembly deck to the main floor on the

platform of a custom designed vertical lift made by Pflow Industries.

Pflow manufactures a wide variety of vertical lifts that move materials of varying sizes to and from heights that can exceed 200 ft. Some are fairly standard, moving primarily boxes and pallets, while others are highly engineered, custom designed to move far more sensitive loads.

A screw lift was selected because it is able to achieve the precise movement required to safely transport the intricate and geometrically complex satellites. Screw lifts eliminate any subtle bounce or deflection that can occur with a hydraulic or mechanical lift. The Boeing lift also features an unusually large platform size and high payload, and travels a short distance relative to standard lifts.

The satellites made at the Boeing facility range in size from 10-20 ft in diameter, with heights up to 60 ft and weights up to 60,000 lbs. They are assembled in a cleanroom environment, and when complete are transported from the assembly deck to the main floor for testing. The lift fits flush within an existing pit in main floor for easy loading and unloading. When testing is complete, the satellites are transported back to the assembly deck for modifications or preparations for shipping. Component parts are also transported by the lift.

The term "screw" is derived from the four mechanical actuating screws on which the 18.5 ft x 20 ft rectangular lift platform is moved. A independent 5 hp motor, equipped with a gear reducer, is dedicated to each of the screws, driving a worm gear, which rotates a nut moving each of the four corners of the lift up and down. The four screws, which remain stationary during movement, are strong enough to support their share of the 80,000 lb capacity of the lift. The three foot trip takes approximately three minutes in each direction, achieving a high level of stability (see sidebar chart).

Boeing Screw Lift Travel Accuracy

- Horizontal step displacements no more than 0.01" during
- vertical movement.
- Smooth horizontal translations (caused by straightness of travel) less than 0.02" over any 10 ft of travel.

- Vertical positioning accuracy (difference between actual and commanded positions) less than 0.1" peak to peak and less than 0.05" RMS.
- Angular change of lift platform position about any axis less than 0.01 degree over any 1 ft of travel.
- The vertical axis remains vertical within 0.01 degrees in all operating conditions.

There are several sophisticated mechanisms that ensure and monitor the precise level of the lift platform. A variable speed drive is installed on each of the motors, ensuring that each motor starts and stops smoothly and moves at a steady, coordinated speed. The screws are also electronically synchronized by electric encoders on each motor to make sure the motors are in the same position on each screw, keeping the platform perfectly level. Encoders with custom software communicate the position of each platform corner to verify the screws are in sync. If the screws become out-of-sync an audio alarm is triggered. Separate pitch-and-roll level sensors shut down the motors if it is not perfectly level, and corner guides provide structural stability.

The screw lift replaced an older hydraulic lift, providing multiple benefits, including smoother movement, more stability and control, and the elimination of the hydraulic oils from coming in contact with components moving in and out of the cleanroom environment.

Pflow pioneered the vertical material lifting system product class in 1977, and has designed and built over 15,000 systems to lift materials from 100 lbs to 100 tons for a diverse group of applications. Complete vertical lifting solutions for mezzanines, balconies, through-floor, interior and exterior applications, in industries including but not limited to manufacturing, warehousing, distribution and retail. Visit www.Pflow.com for more information.



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