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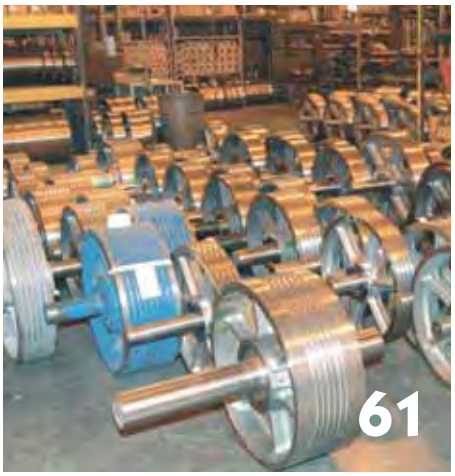
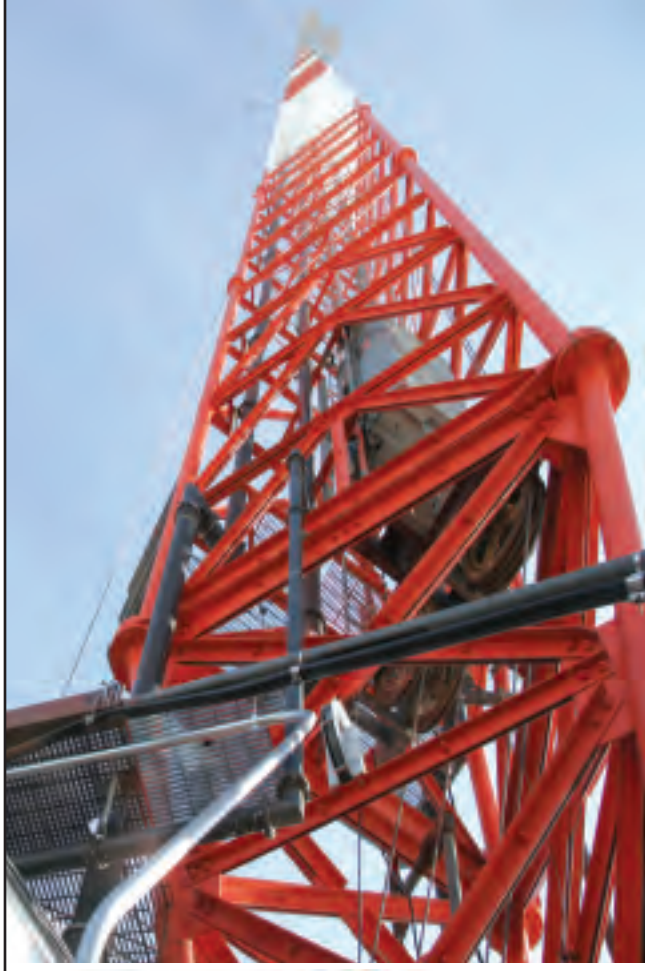


COVER: MRL, Made in America

FEATURES:

Rack-and-Pinion Gear-Drive System for Spires of Steel

by Todd Grovatt and Jim Tiner



"Spires of Steel," which was published in the June 2006 issue of ELEVATOR WORLD, described the application of traction-elevator technology to provide access to broadcast towers standing as tall as 2,000 feet above ground level. While this elevator technology has been successfully utilized in towers for over five decades, a recent innovation has made rack-and-pinion-drive elevators viable alternatives for these structures as well.

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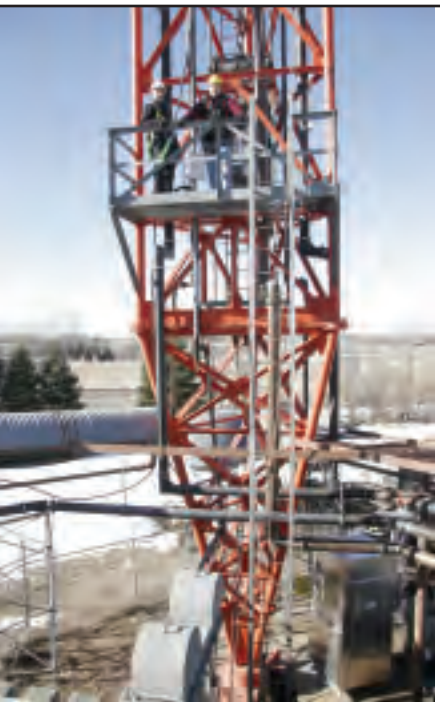

Rack-and-Pinion Gear-Drive System

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Until fairly recently, the difficulty in distributing high-voltage electrical power to a moving elevator car or to the top of an outdoor structure of such a great height has eliminated the possibility of using a car-top-mounted or overhead hoist machine on a broadcast-tower elevator installation. This has necessitated the use of a traction machine mounted at ground level, as described in "Spires of Steel." However, with the development of the Trac-Cab® TC-1000, which uses a 240/480-volt, three-phase AC power and communication feed cable that runs to the car and that is managed by a ground-level-mounted Smart-Reel® system, the use of rack-and-pinion drives on broadcast-tower elevators is possible.

The new rack-and-pinion tower-elevator system was developed by and is available from Tower Elevator Systems, Inc. of Austin, Texas. In addition to broadcast-tower-elevator solutions, the company provides rack-and-pinion elevator systems for all industrial applications.The system is ASME A17.1 code compliant, and rated to carry both personnel and materials to the top of tall broadcast towers safely and reliably. The elevator system can be mounted on the inside or outside of the tower structure. On outside-facing installations, the car travels all the way to ground level. Advantages of outside installation are ease of loading the car, the ability to carry large items (such as ENG or microwave antennae) and the elimination of expensive stairways to an above-grade elevator landing. Additionally, with this type of installation, the tower shaft area is made available for mounting transmission lines, which can allow a smaller face-width tower, since the entire tower shaft is clear of the elevator apparatus.

Above (top to bottom):
- *Ladder to above-grade landing*
- *A conventional traction elevator machine*

At right:
- *Smart-Reel training session led by Jim Tiner, CEO of TESI*

for

Spires of Steel

Clockwise from upper right:
- Car-operating panel
- Smart-Reel enclosure and ground control panel
- Smart-Reel adjustment and setup

The new rack-and-pinion tower elevator is powered with a 20-HP electric motor coupled to a hydrostatic transmission driving two independent pinion gears. Each pinion drive has a spring-operated, normally closed automatic safety brake. The brakes are released by the hydraulic pressure to allow elevator travel. Standard capacity is 5000 pounds gross load at 95 fpm. Useful load is 1750 pounds. The cab is provided with lighting, 110-VAC duplex utility outlets and, optionally, a small boom crane mounted atop the car for equipment loading. The system is fitted with a rescue mode to allow the car to safely lower itself by using hydraulic bypass valves in the event of a power loss. A small hydraulic hand pump can be used to apply pressure to release the automatic brakes.

The car-operating panel uses a man-machine interface, (MMI), with a daylight-readable, vacuum fluorescent text-display screen that enables the operator to view the current operating status of the elevator as well as total car loading. The car floodlight illuminates the door threshold automatically whenever the car gate is opened to meet the ASME A-17.1 requirements for the lighting of elevator cars and entryways.

The 240/480V three-phase AC power and communications cable feed to the car is managed by a Smart-Reel system, which is mounted near the car landing area at ground level. The car is provided with a dial-tone-capable telephone/intercom unit that can communicate with the tower base station and the broadcast-station transmitter building. Provision of dial-tone access is at the discretion of the broadcast-station site manager.

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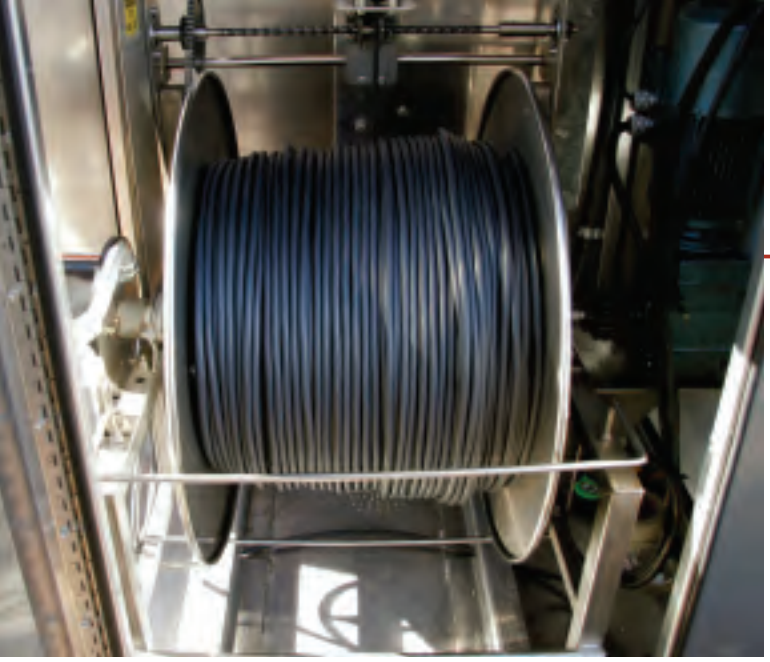

Rack-and-Pinion Gear-Drive System

At left (top to bottom):
- Smart-Reel system
- Dual pinion drive and integral I-beam rail and rack system
- Trac-Cab controller and communications system

Continued

The car-travel guide rail uses a wide-flange I-beam designed to minimize wind load and weight. The rail/rack attachment is rigid at the tower base with universally fitting friction ties to the tower structure at each tower's horizontal member, eliminating the need for punching custom holes. The system wind load will approximate conventional two-inch pipe rails, 5/8-inch lift cables and 5/16-inch induction cable. The gear-rack track is welded to the I-beam prior to galvanizing in units approximately 12 feet in length. The system can actually "build itself" on new tower construction, and the Trac-Cab can be used as soon as the stub section is erected, allowing use for crew access and/or transmission-line installation.

The Trac-Cab TC-1000 system is comprised of the following main components:

- Motor Controller/Pinion Drive: The 20-HP motor and controller are located on the car along with the hydraulic pinion drives. The hydraulic drive allows variable-speed control of the car travel. The digital-display operator panel indicates both operation status and total car load. The drive system is fitted with a safety relief valve preventing system overloading.
- Smart-Reel Cable Reel Drive: Housed in a protected enclosure at the tower base, the Smart Reel provides for take-up and let-out of the power/communications cable as the car travels, maintaining a constant electrical connection through a slip-ring device on the reel. The control cable is stored on the reel in the weather-protected enclosure when the elevator is at the base landing.
- Hard-Wired Power/Communications Cable: Tethered to and traveling with the elevator car at all times, the cable furnishes AC power and phone/intercom connection to

for Spires of Steel

At right (top to bottom):
- (l-r) Todd Grovatt, president, and Tiner
- Grovatt at ground-level communications station
- Smart-Reel cable guide and damping system

the motor controller and car-station operating panel.

- Telephone/Intercom System: The telephone/ intercom system allows direct communications for all telephone extensions on the system. Outside-line access for emergency calls or general use may be provided at the discretion of the broadcast-tower site manager. The system incorporates a user-friendly voice-message-information feature to supplement the written user-operation documentation. Using the telephone keypad, a user has access to voice recordings for operation, emergency procedure and recordable site-specific hazard information, including radio-frequency hazards.

This patented rack-and-pinion elevator technology brings the broadcast industry another alternative for the installation of elevators in broadcast towers rising thousands of feet above the ground.

Grovatt

Todd Grovatt *is the president and chief operating officer of Tower Elevator. He holds a Finance degree from the University of Tampa (Florida) and has over 15 years' experience in business management shared between the broadcast-tower industry, the software industry and industrial elevator systems.*

Tiner

Jim Tiner *is the inventor of the Smart-Reel cable-management system, and is the founder and CEO of Tower Elevator. He is an NAEC certified elevator technician and has over 30 years' experience with tower elevators.*