A COMPARISON OF EMERGENCY-POWER REQUIREMENTS FOR HYDRAULIC VERSUS TRACTION ELEVATORS

by W. John Reinartz

Reynolds & Reynolds Electronics, Inc. (R&R) is a leading manufacturer of elevator emergency-return units (ERUs). R&R has been in business for more than 17 years and witnessed many technological changes in the elevator industry. The latest change has been an increased demand for traction-based Powervators®. This article discusses the fundamental differences between hydraulic-based Powervators and traction-based Powervators.

Hydraulic-based ERUs have been available for many years, and are understood throughout the elevator industry. Proprietary changes to the elevator controller software are needed for some hydraulic-based ERU applications in order for elevators to initiate a recall when there is a loss of normal building power.

Traction-based ERUs are relatively new to the market and may require that OEMs implement a one-time proprietary change to the elevator controller software, and possibly to the drive software. OEMs should consider these changes in the design stage of new elevators. Once these changes are complete, OEMs will be able to provide one-stop shopping for their customers in the form of a complete elevator solution with battery backup and documentation.

◀ *Illustration of a hydro*
(Courtesy of KONE Inc.)

Hydraulic Applications

During a power outage, elevator passengers expect an elevator to descend to the main or lobby level, open its doors and allow passengers to exit. This is often referred to as an elevator recall.

The elevator system both determines when a recall is necessary and initiates the recall. The Powervator simply provides power when normal building power is lost. The power required by the elevator system is typically low for a hydraulic elevator (hydro). When normal building power is present, normal power (excluding power for the hydraulic-pump motor) flows through the Powervator to the elevator system. The Powervator circuitry must be robust enough to carry this normal building power as it passes through the ERU to the elevator. Under emergency conditions, the Powervator disconnects mainline power from the elevator system and provides emergency power to the system instead.

There may be a perception that all hydro systems readily accept Powervators. This is not always true. When hardware is used to "sense" a loss of normal building power, a Powervator can usually be installed as a plug-and-play component. The software in a hydro controller is usually preconfigured to accept a Powervator as a plug-and-play component. However, some hydros have proprietary software that must be changed in order to recognize an ERU. When this is the case, the elevator field technician may have to install modified software when a Powervator is present.

Gravity, Power Consumption and Cost

Consider the physics of the hydro versus the physics of the traction elevator (overlooking, for the moment, the safeties, etc. that are present in fully functional elevator systems).

Hydro-based Powervator ▼

- In a hydro, the force of gravity will bring the elevator down unless power is applied via a motor to the hydraulic pump.
- In a traction elevator, gravity may bring the car up or down based on the elevator load (i.e., how many people are in the car.) The elevator's counterweight is approximately

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50% of its rated capacity. A car with contents that are heavier than the counterweight will go down, while one that is lighter than the counterweight will go up.

Under emergency-power conditions, both hydraulic- and traction-elevator designs may take advantage of the force of gravity. The benefits of these designs result in a low-cost, simple emergency-power solution.

- A hydro system with a Powervator may enable the elevator to descend.
- A traction-elevator system with a Powervator may enable the elevator to go up or down, depending on the load in the car.

Traction Applications

For years, owners of small buildings (between two and six floors) have been buying low-cost, hydro-based Powervators. Building owners may think that hydraulic and traction ERU applications are the same. However, the normal power passing through a traction-based Powervator is much greater than the normal power passing through a hydro-based Powervator, due to the VVVF drive and brake loads. Also, the power generated by a traction-based Powervator during a loss of power is much greater as well. In order to support the increased power requirements, the circuitry in a traction-based Powervator is more robust than that of its hydro-based counterpart. Additionally, most hydro-based Powervators are designed for single-phase power applications, while traction-based Powervators are designed for three-phase applications. These factors greatly influence manufacturing costs.

As with hydros, the traction-elevator system determines when a recall is necessary and initiates the recall. The Powervator simply provides power when normal building power is lost. To initiate a recall of a traction elevator:

- the elevator controller needs to know the weight of the passengers and the controller needs to determine whether the elevator will go up or down based on that weight (load-weigh system).
- the elevator controller needs to tell the VVVF drive to run at inspection speed (decreased power usage) to the next available floor.

Proprietary software changes may be required to both the controller software and the VVVF drive software in order to accomplish a recall of a traction elevator. For each elevator OEM, this change need only occur once for each elevator controller/drive combination. The OEM can then provide a complete elevator solution with the ERU and appropriate documentation.

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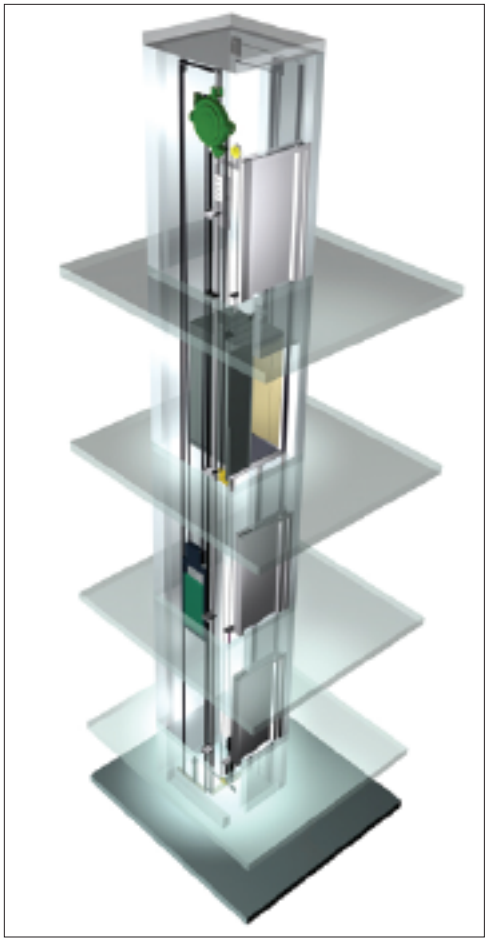

◀ *Illustration of a traction elevator*
(Courtesy of KONE Inc.)

Traction-based Powervator ▶