

Case	Application: Delta Industrial Automation Products for Elevator Solution				
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Applicable to	Delta IED Series				
Key words	IED, elevator, AFE				

【Introduction】

As the global warming issue becomes critical, the worlds today has been looking for solutions to lower carbon emission and seeking for renewable energy. Delta has been developing all kinds of green products and provides energy saving solutions to industrial automation, building automation and many more categories. The Taoyuan plant 1 was activated in 1984 and its freight elevator system are 28 years old ready which need to be replaced. Recently, Delta has introduced a new energy saving elevator drive to the market, the Integrated Elevator Drive (IED series) and it is implement to Taoyuan plant 1 to modernize the old elevator system. The IED series provides outstanding energy saving result while providing safe and smooth rides.

【Modernize the old elevator system】

Old system conversion plan and replacement items:

1. Traction system (Motor)
2. Control system
3. Implementation of Active Front End product
4. Delta cloud integration system for real-time monitoring

【Replacement Items】

1. Traction system (Motor)

Replacing the induction motor:

Motor efficiency have boost up to 95% simply by replacing the old 15hp induction motor with a 5hp PM motor. PM motor further provides the following benefits:

1. Energy saving with excellent dynamic control
 2. Stable operation with low noise
 3. Compact size
 4. Long product life and improved reliability
 5. Energy consumption reduces by 50% comparing to an induction motor and reduces by 64% comparing to a hydraulic elevator.
 6. Lower maintaining cost. It is no longer required to replace mechanical gear oil annually and no oil stain.
2. Control system

Replace the old elevator drive with Delta IED series:

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The Delta IED series integrates controller and drive functions into one MCU for ultimate efficiency and great performance. Its design follows the high safety standard UL/CE to ensure safe and reliable rides and offers many safety parameters including watchdog protection (real-time monitor the MCU), dual-loop relay (safety), output phase loss protection (ensures tractor operation) and auto torque output (ensure operation safety when brake is released). Delta IED series offers one-stop shopping for all you need in an elevator drive including planning, assembly, technology and all other services.

It is designed with provisions for full technical and maintenance support and. The planning, assembly, technology and additional services are all included with Delta IED series by one-stop shopping. Delta as your most reliable partner presents this specialized solution for ultimate performance.

3. Delta Active Front End (AFE2000) Implementation

(See Figure 1) A high-watts brake resistor is usually applied to a traditional AC motor drive to absorb the excess regenerative energy generated by operation of motor and frequent braking. It is also used to prevent the surge current causing over voltage and burns out the capacitor. However, using brake resistors as an excess energy solution not only creates additional hardware cost, increases peripheral temperature but also occupies more space.

(See Figure 2) The Delta AFE2000 series provides a new solution, instead of dissipating regenerative energy as heat, it converts regenerative energy into reusable electricity and sends it back to the mains, which reduces total energy consumption.

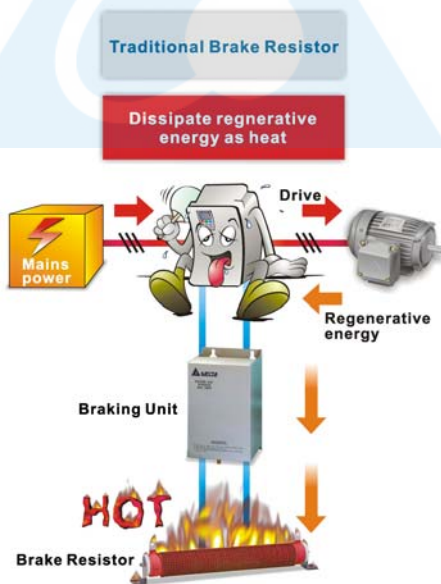


Figure 1

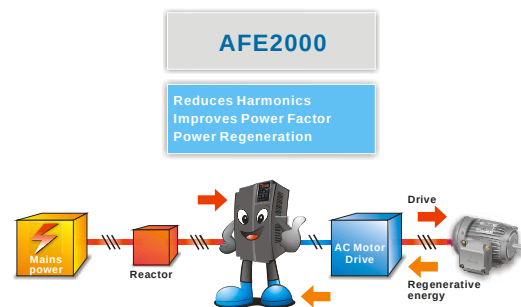


Figure 2

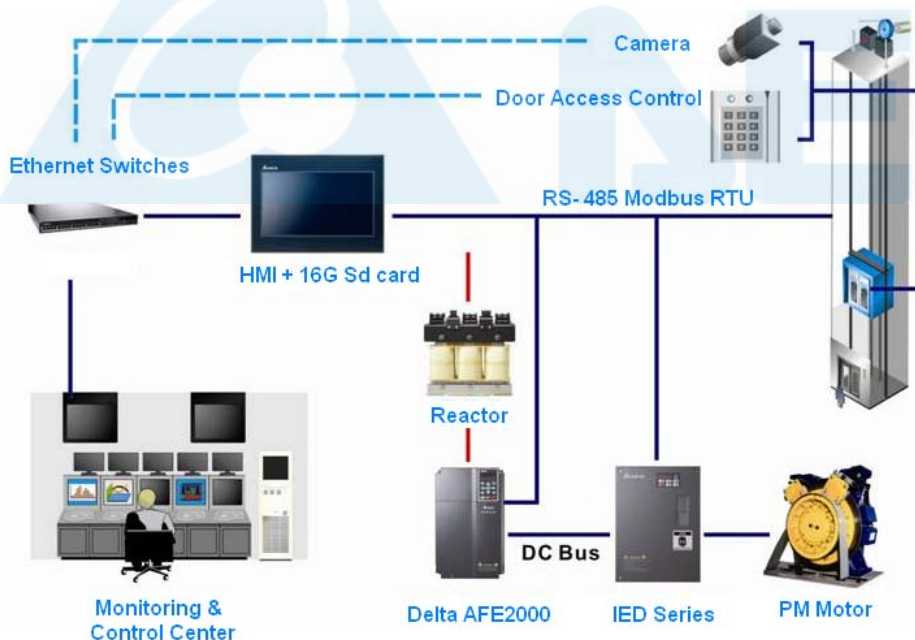
Active Front End (AFE) is a controllable rectifier with advantages such as providing bidirectional power exchange between AC and DC power and regenerating reusable power to the mains to reduce the cost of power. The AFE uses PWM modulation to minimize surge current and form perfect sine wave current. The

power factor is corrected up to 1—the ratio between load capacity and power capacity is 1:1. In addition, the AFE eliminates high order harmonics, provides very low harmonic current THD < 5% while improving the power factor, which allows you to save the cost of purchasing additional electrical equipment for better power quality. The AFE also offers stable power quality unaffected from mains power fluctuations and can be applied to a parallel serial connection.

4. Delta Cloud Integration System for Real-time Monitoring Control

The Delta cloud integration system is adopted to Delta Taoyuan R&D center for real-time monitoring and control on many devices, including elevator, door access and alarm warning system. When this system is connected to a central monitoring wall, all relevant data collected will be visible on this wall. A management team can monitor the building efficiently simply by watching at this central monitoring wall. The elevator operation status is available and the camera in each elevator is connected to the central monitoring wall for live broadcast. Also door access control system is implemented in every elevator for security purpose. When HMI is installed, it allows user to see the public information, power consumption rate of each system and the portion of energy saved if energy saving product is implemented. This system also provides far-end monitoring function. When an alarm went off, the cloud integration system will send a warning notice to management team's cell phone so a treatment can be done immediately.

【Elevator System and Power Monitoring】



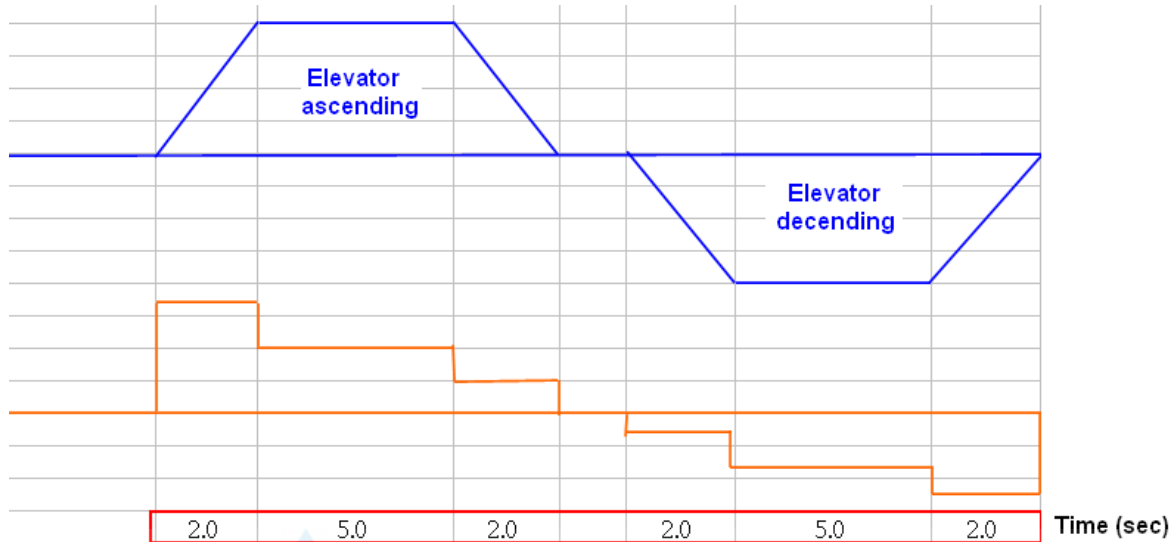
【Elevator Performance Analysis】

The Delta AFE2000 is an energy saving product that provides obvious energy saving results. It converts regenerative energy into reusable power for other equipments. The tested result shows a modernized elevator system using AFE2000 saves up to 52.1% of energy comparing to an old elevator system using traditional brake

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resistor. In addition, using a PM motor instead of induction motor would improve the power efficiency even more. The test result shows an induction motor consumes 7.9 kWh while a PM motor consumes only 3.1kWh, the 4.8kWh difference is the main reason we use PM motor for the modernized elevator system.



Motor Type	Elevator Speed (m/min)	Capacity (kg)	Energy Saved (%)	Power consumption as elevator goes up/down for 1000 times (unit: kWh)	
				AFE2000	Brake resistor
Permanent magnet (PM) motor	90	550	52.1	3.1	6.5

Motor Type	Elevator Speed (m/min)	Capacity (kg)	Energy Saved (%)	Power consumption as elevator goes up/down for 1000 times (unit: kWh)	
				AFE2000	Brake resistor
Induction motor	90	550	9.8	7.9	8.7

The old elevator modernization plan was taken place in Delta Taoyuan Plant 1, the 28 years old elevator system is replaced with Delta IED series and have provide genuine energy saving result up to 52% which directly cost down the electricity expense. Once again, Delta has achieved our ultimate mission, "To provide innovative, clean and energy-efficient solutions for a better tomorrow."

For more information on industrial automation products, please visit our website at: www.delta.com.tw/ia