

## Regenerative Drive

The smart choice

### BENEFITS

- ▶ Environmentally friendly
- ▶ Energy savings (up to 70%)
- ▶ Lower Harmonic Distortion (typically below 5%)
- ▶ Reduced Radio Frequency Interference
- ▶ Significant cost savings
- ▶ Smaller main cables
- ▶ Reduced power demands in peak periods

### FEATURES

#### Environmentally Friendly

Energy savings, lower harmonic distortion and smaller radio frequency interference that meet or exceed the established world standards make regenerative drives the product of choice for 'green' building initiatives.

#### Energy Savings

In a typical non-regenerative drive, energy is dissipated as heat in a set of resistors when braking occurs, resulting in reduced efficiency and creating additional waste-heat loads in the building. The regenerative drive feeds this energy back into the building's internal electrical utility where it can be used by other loads or users connected to the same network.

Otis' regenerative drive is so efficient that its 'power factor'  $\cos(\text{PHI})$  is close to unity. The result is a reduction in overall energy demands on the building by up to 70%.

#### Low Harmonic Distortion

Regenerative drives produce 'clean power' with low distortion of the incoming sinusoidal waveform line current. Total Harmonic Distortion (THD) at nominal load is typically equal or below 5 per cent, versus more than 80 per cent for non-regenerative drives—resulting in less pollution of the building's electrical power system, thus helping to protect sensitive building equipment.

#### Reduced Radio Frequency Interference (RFI)

Otis regenerative drives are designed to substantially minimise the RFI, also known as Electromagnetic Interference (EMI), in compliance with strict legislations around the World.

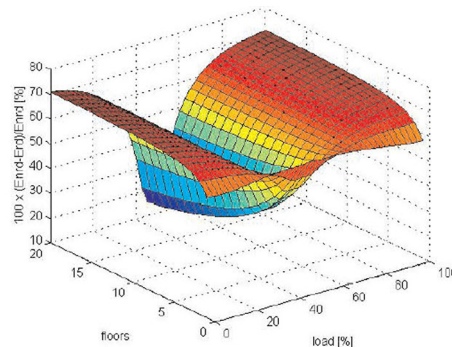
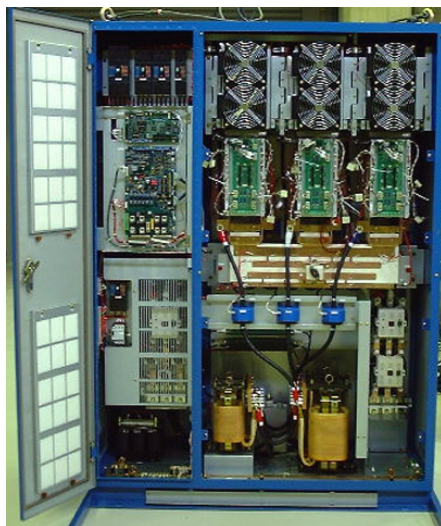
#### Significant Cost Savings

Two key factors influence the energy costs:

- ▶ A fixed amount per year proportional to the subscribed peak power demand expressed in kilovolt amperes (kVA)
- ▶ A variable amount related to the energy consumption expressed in kilowatt-hours (kWh)

With Otis regenerative drives, both the peak power demand and the energy consumption are substantially reduced.

The overall effect is significant savings to the building owner and tenants, year-after-year during the life of the elevator.



Energy saving with a regenerative drive in relation to the number of floors and percentage of load. Maximum energy saving of 70 per cent can be achieved when the car load is zero or 100 per cent.

# Regenerative Drive

Electrical power is generated when the elevator travels up with a light load, travels down with a heavy load and during the elevator system's deceleration. In effect, a fully loaded, descending elevator can now provide a significant portion of the power for an adjacent ascending elevator.

The amount of energy savings due to regeneration depends on various system parameters and configurations such as duty load, speed, length of run, traffic pattern and system efficiency.

Modelling and simulation results show that Otis regenerative drives use up to 70 per cent less energy than non-regenerative drives for equivalent elevator motion; that is, the energy consumed by the propulsion system to move the loads.

As a 'green' cost-effective option for the Gen2 system, Otis regenerative drives are the smart choice for your next low or mid-rise installation.

## SPECIFICATIONS

Otis regenerative drives can be used with geared or gearless systems (up to 15 m/s) and is best suited for application on Gen2 systems.

### Typical duty specification

Gen2 systems with loads from 1150kg to 1600kg and speeds from 1.0 m/s to 2.5 m/s are ideally suited to an Otis regenerative drive.

Profile: 20-floor building, 60 metre rise, 300,000 trips per year.

Duty	Gen2 system Regenerative Drive Gearless PRSM motor		Gen2 system Non-Regenerative Drive Gearless PMSM motor		Geared system Non-Regenerative Drive Induction Motor (IM)	
	Energy [kWh]	Cost (*)	Energy [kWh]	Cost (*)	Energy [kWh]	Cost (*)
1275 kg 1.6 m/s	3261	\$ 326	8721.7	\$ 872	12845	\$ 1285
1600 kg 1.6 m/s	4086.9	\$ 409	10929	\$ 1093	16137	\$ 1614

(\*) Cost of energy assumes \$0.10/kWh

### Optimal System Performance

The combination of regenerative drive control with Permanent Magnet Synchronous Motors (PMSM) permits the optimisation of motor and drive voltages resulting in a reduction of currents during regular usage.

### 'Brown-out' tolerant

The drive will continue to operate with acceptable levels of degradation (reduction of contact speed and acceleration rates) in the event of a drop in voltages up to 30% below standard.

### Superior ride quality

State-of-the-art, 32-bit high-speed digital signal process and new control algorithms for profile generation and position accuracy result in a smoother ride and improved floor-to-floor time to move more people in less time.