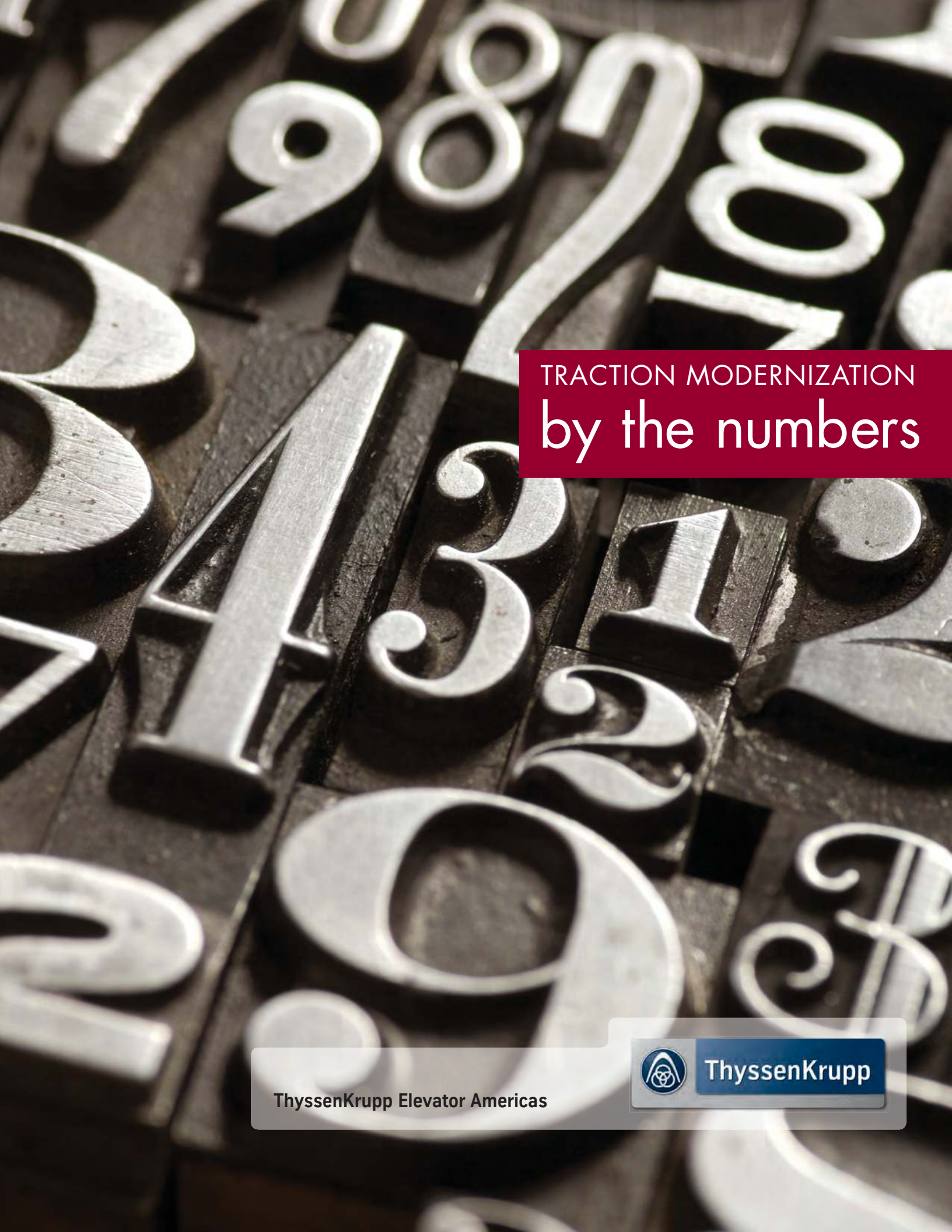


TRACTION MODERNIZATION
by the numbers

ThyssenKrupp Elevator Americas

ThyssenKrupp

why modernize?

Some of the results you can expect by modernizing with ThyssenKrupp Elevator's latest technology

- Increased property value
- Conserved energy
- Optimized ride performance
- Increased reliability
- Improved traffic flow through better dispatching and improved travel times
- Code compliant vertical transportation
- Reduced wiring

By modernizing your elevators, you will save money, increase your property's value, provide safe and code compliant vertical transportation and improve the energy efficiency and traffic flow in your building.

Why choose ThyssenKrupp Elevator?

ThyssenKrupp Elevator's Modernization Teams can handle assignments ranging from simple cosmetic refurbishment of cars to total elevator system replacement. Your needs and your budget are the determining factors. Whether your elevators are five or fifty years old, you can rest assured that you are getting the best products in the industry.

A. Machine room before modernization

B. Machine room after modernization

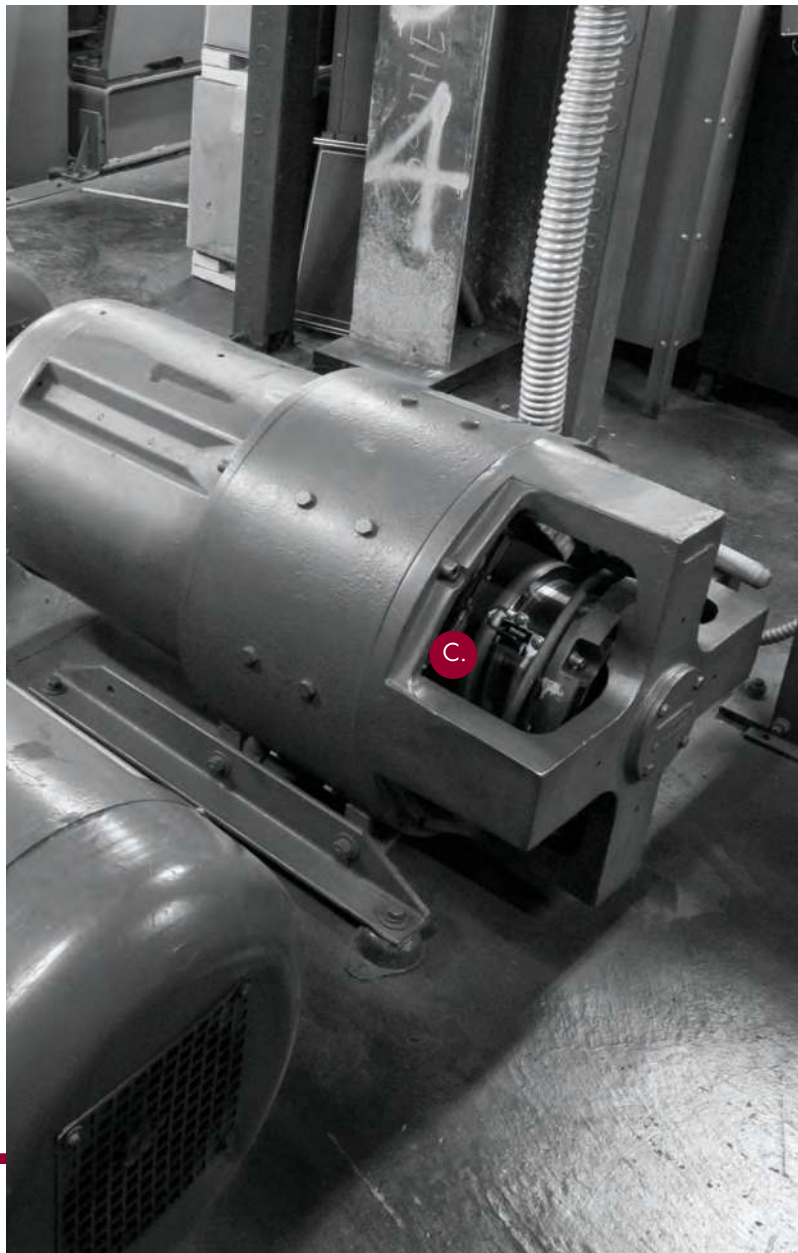
modernization drives

DC motor generator to AC digital drive

In the early 1980's, motor generator technology was utilized on virtually all traction elevators. This technology converted an AC building power supply to a DC power supply, to power a DC hoist motor. Technological advances have allowed us to control AC current, eliminating the need for motor generators to convert to DC power. This has lead to the latest generation of AC digital drives, including the ThyssenKrupp Elevator Accord Drive™, which are environmentally-preferable and more efficient for the following reasons:

ADVANTAGES OF AC TECHNOLOGY:

- Uses significantly less energy, because it only runs when the elevator is running.
- The drive is now a small digital microprocessor which fits in the elevator controller. With some applications, use of regenerative drives will result in giving power back in the building.
- This cleaner system eliminates airborne pollutants from carbon dust.
- Heat reduction with elimination of motor generator, reducing the air conditioning needs to cool equipment.
- Reduces cleaning.
- Reduced materials, for a smaller carbon footprint.
- Frees up floor space.
- Performs more consistently.



average elevator energy reduced by

72%

Did you know that elevators with old motor generator technology consumes over 40,000 kWh of electricity annually? If you take all MG sets installed and operating in the U.S., that's enough electricity to power over 800,000 homes annually. By modernizing these older, less efficient elevators with new ThyssenKrupp Elevators with the latest technology drives and controllers, the average elevator energy usage would drop by 72%.

That's ThyssenKrupp Elevator's leadership in sustainability.

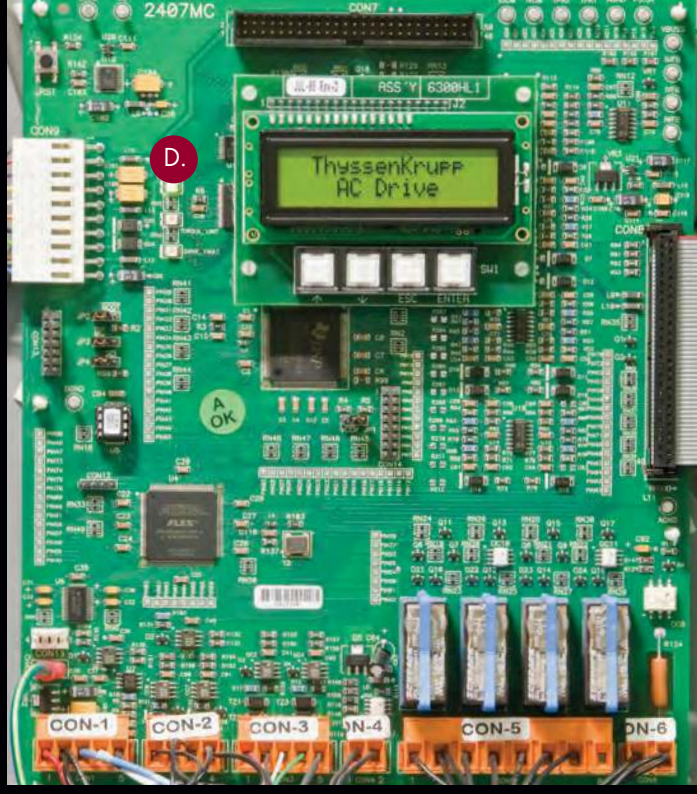
A. Brush Holders – constant wear created carbon dust

B. Carbon Brushes – needed constant replacement

C. Motor Generator – eliminated and replaced with AC drive

D. AC Regenerative Drive – replaces the need for a motor generator

E. Controller with AC Digital Regenerative Drive



A.

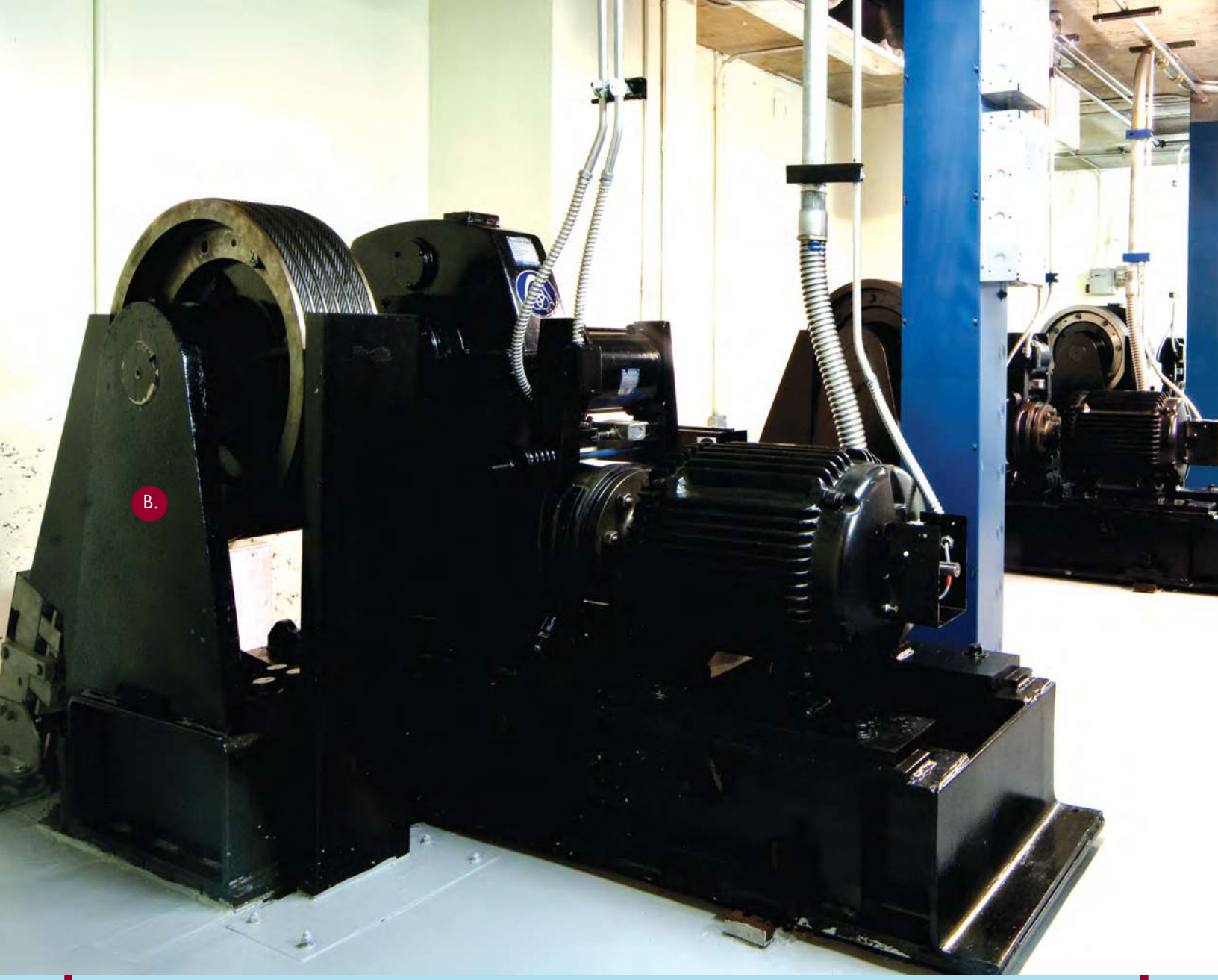
modernization geared machines

DC hoist motor to AC hoist motor

The conversion of a geared machine from DC to AC is typically done in conjunction with a motor generator & drive modernization. The machine, including gears, sheaves and bedplates, is reused, while the DC hoist motor is replaced by an AC hoist motor.

ADVANTAGES OF DC TO AC MOTOR:

- Less energy used.
- Use of alternating current results in higher performance than direct current.
- Cleaner system eliminates airborne pollutants found in carbon dust.
- Heat reduction associated with AC motor reduces the air conditioning needed to cool equipment.
- Requires less cleaning.
- Reduces materials, for a smaller carbon footprint.

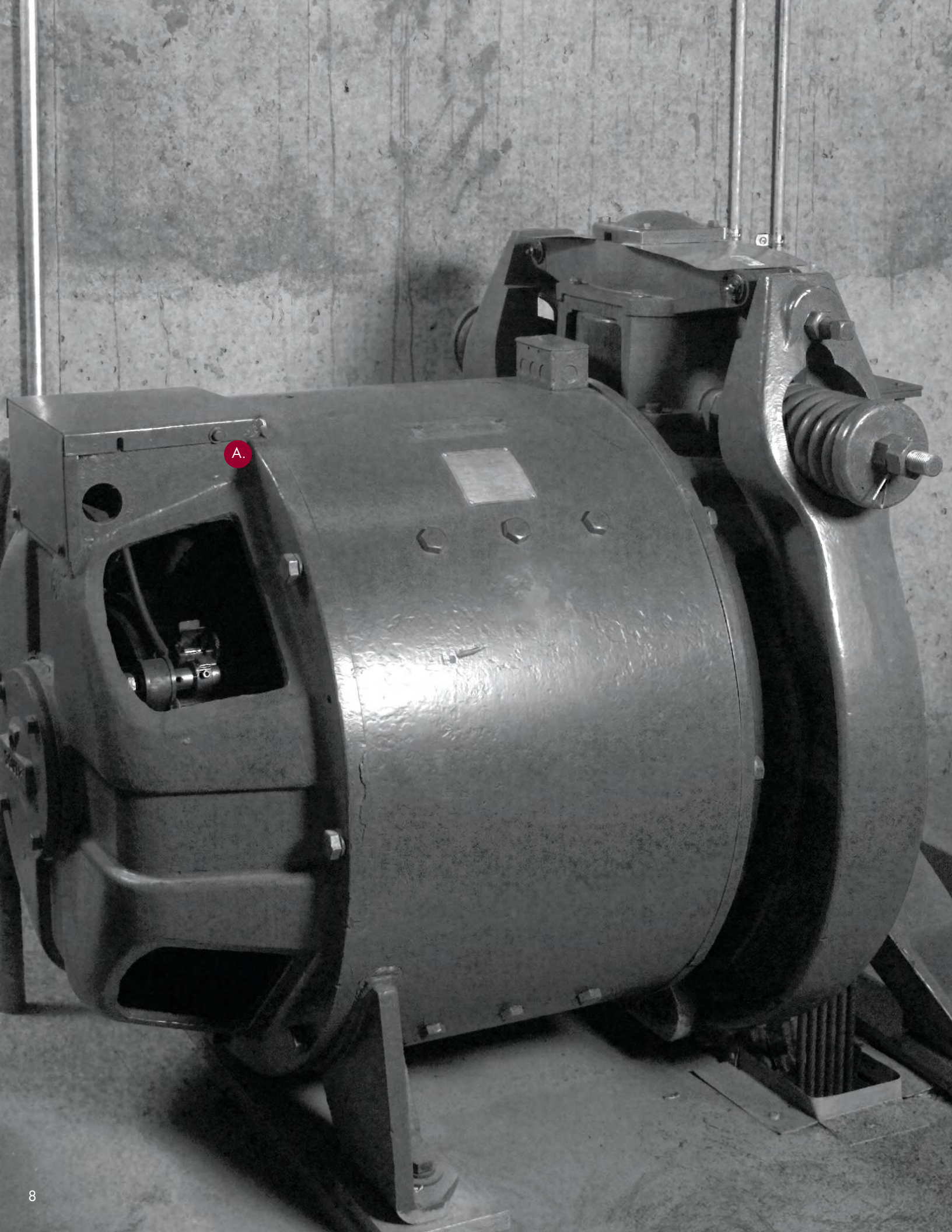


A. Existing geared machine with DC hoist motor

B. Existing geared machine with new AC hoist motor

45%

BTU reduction


A.

modernization gearless machines

DC gearless machine to AC gearless machine

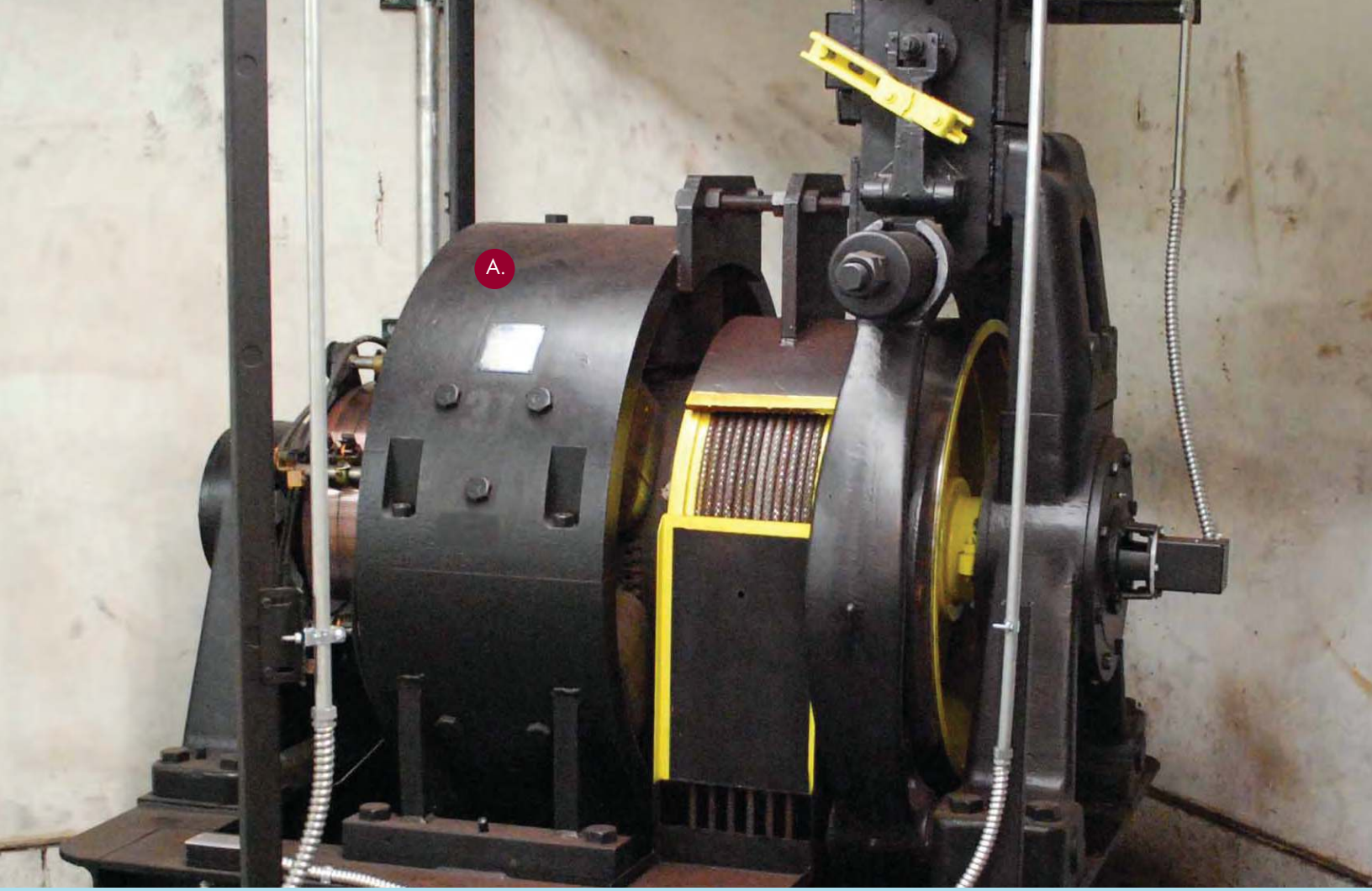
There are times when the existing gearless DC machine needs to be replaced in its entirety by a new AC gearless machine. It is accompanied by a new drive system and requires re-cabling of the elevator. In some cases, this modernization allows for the use of a smaller machine, while maintaining the superior performance and high speeds of a gearless application.

ADVANTAGES OF DC TO AC MACHINE:

- Uses significantly less energy.
- Cleaner system eliminates airborne pollutants found in carbon dust.
- Heat reduction associated with AC motor reduces the air conditioning needed to cool equipment.
- Requires less cleaning.
- Reduces materials, for a smaller carbon footprint.

A. DC gearless machine

B. AC gearless machine with smaller footprint



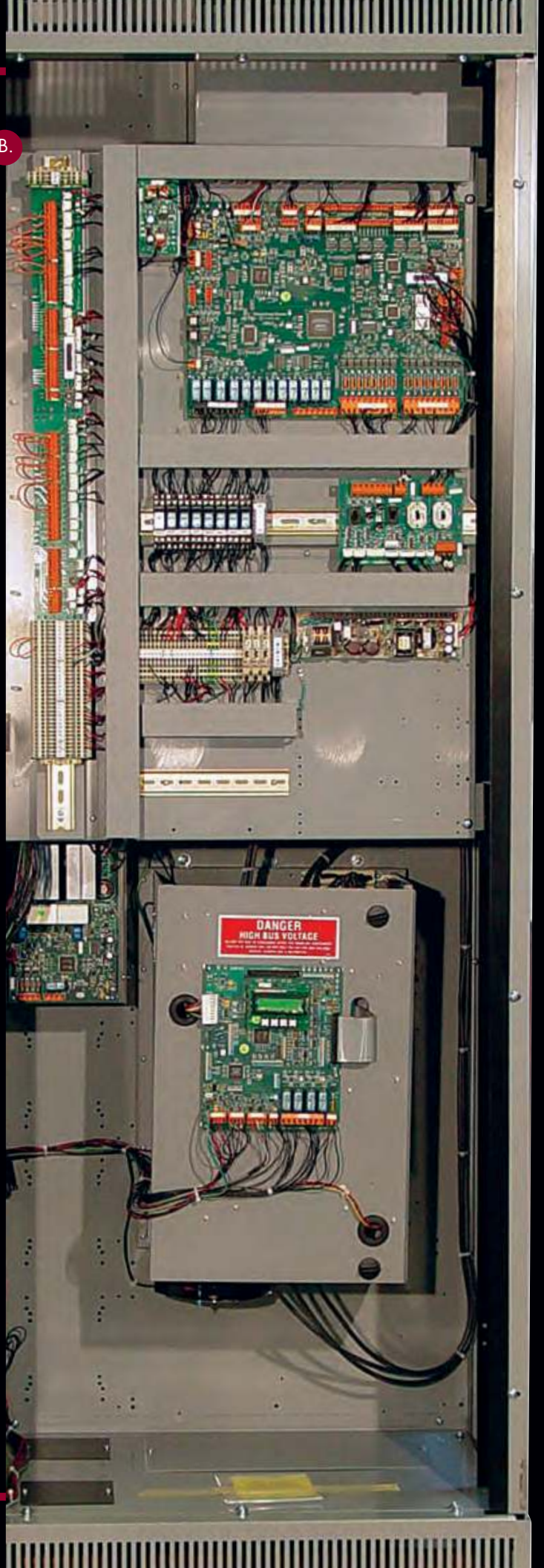
modernization machines

reuse existing gearless machine

In some applications, due to the location of the gearless machine, is it not possible or cost effective to replace the DC with a new AC machine. To gain the benefit of a new control and drive system, we offer modernizations with new controls and digital DC drives that are compatible with the existing DC gearless machines. This type of modernization eliminates the need for a motor generator and allows for a digital drive, which offers better performance and handling capacity. It also reduces energy consumption.

99%

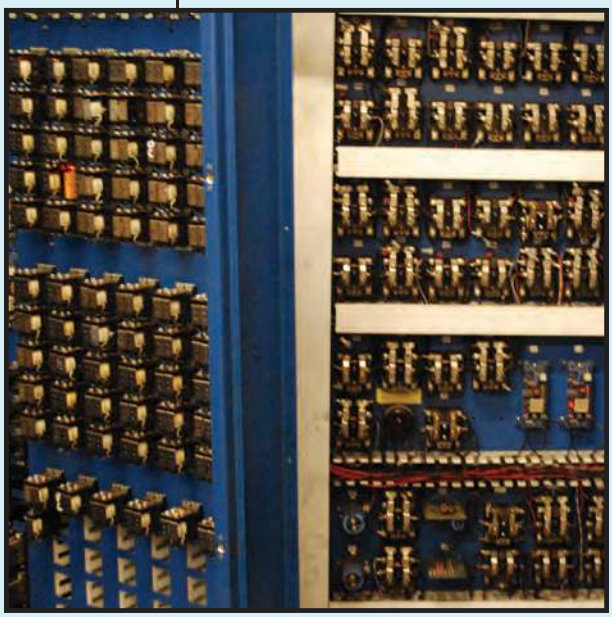
power factor



A. Reuse Existing Gearless Machine

B. PWM Drive for DC Gearless Hoist Machine

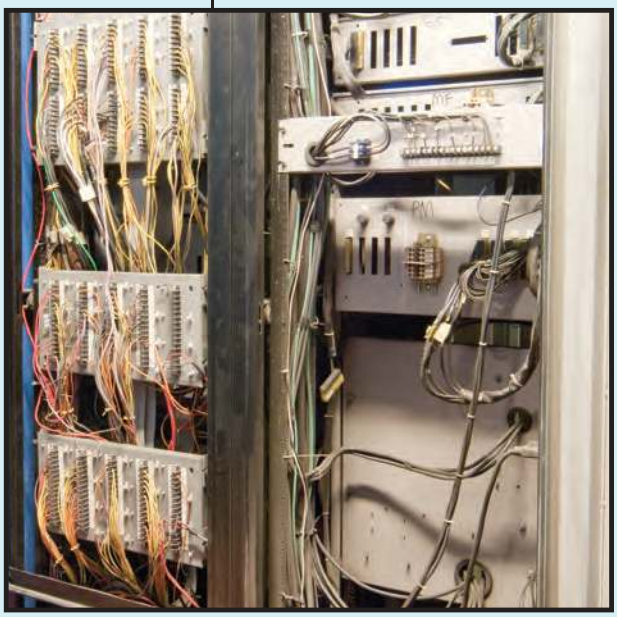
1980



relay logic

During its day, relay logic was considered advanced technology.

1986



solid state

However, with the introduction of solid state controllers, electrical relays and mechanical switches were replaced for improved performance.

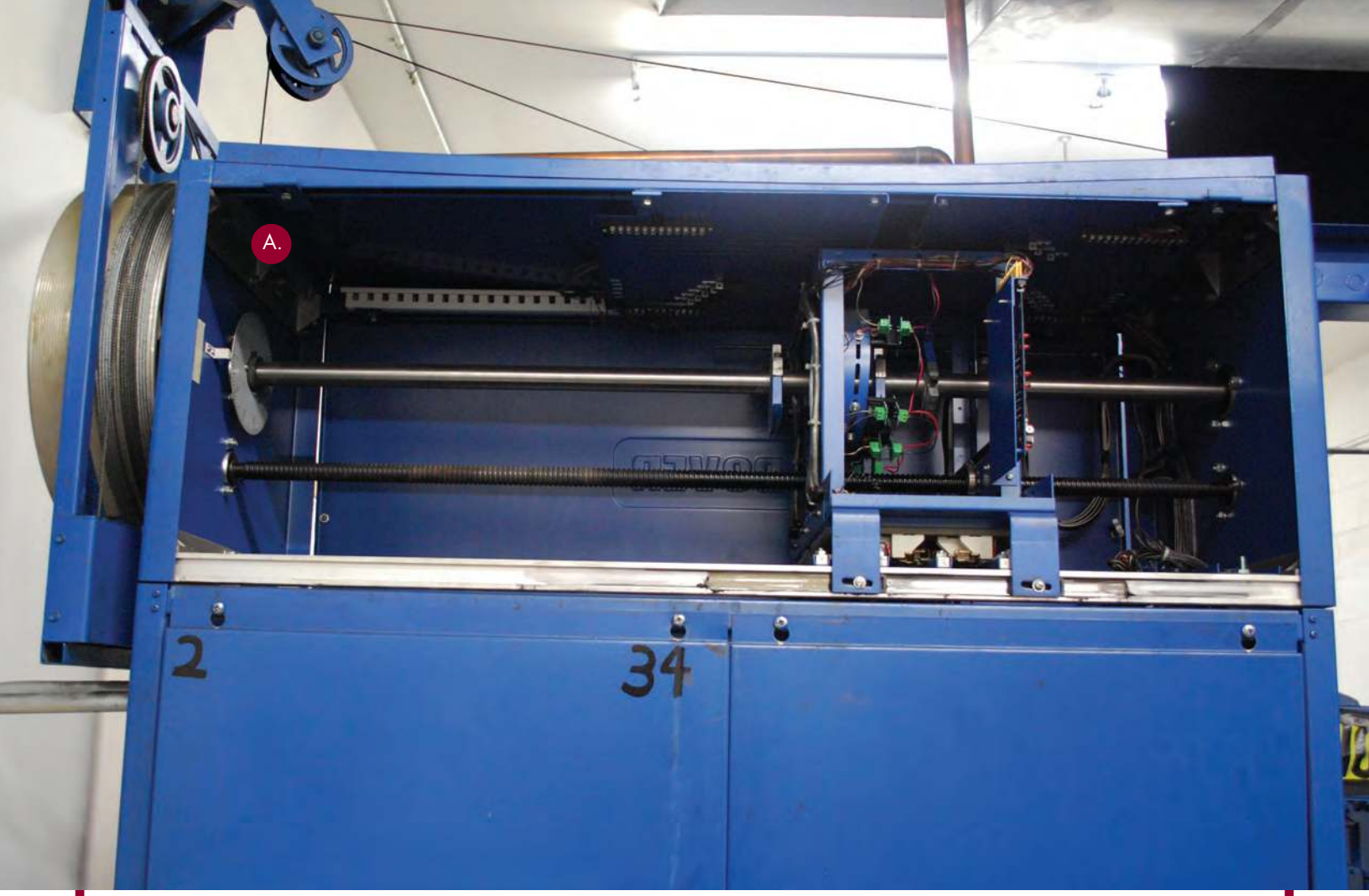
modernization controller technology evolution

today

Controller technology progressed from solid state to digital with current control systems using high-speed 32-bit microprocessors. Current elevator systems make thousands of decisions per second, perform self-diagnostics and traffic analysis, all of which improve elevator performance. Newer systems can improve performance over relay logic systems, in most cases over 30%, while utilizing less space in the elevator machine room and performing with the reliability that is not capable by older technology.

32-bit microprocessor

technology from past to present



modernization controllers

controller technology

ThyssenKrupp Elevator's TAC50M digital controller offers precise stops and starts. Using statistical information and advanced algorithms, the TAC50M provides optimum performance with energy efficiency by considering many possibilities before reaching an operational decision. The control system continuously scans all elevator activity and reassigns calls as necessary to reduce passenger wait time.

Our TAC50M has the technology to monitor the vital signs of your elevator system 24/7.

A. Relay logic control system with selector cord positioning

B. TAC50M Microprocessor Controller

C. Reduces number of controller cabinets, creating additional floor space

intelligent. innovative. efficient. accurate. reliable. flexible.

60%

reduction in electrical usage with new hoist motor and controller


A.
B.
C.

modernization

machine room improvements

One of the many benefits of modernizing an elevator system with new drives, controllers & machines is a machine room environment that is cleaner, cooler and safer. Other benefits include a reduction of heating and cooling required for the machine room. Creating space allows for better operating conditions and, in some cases, the need for entire machine rooms is eliminated.

A. Existing Controllers

B. Motor Generators – eliminated & replaced with AC Drives

C. DC Geared Machine

D. TAC50M Controller

E. AC Gearless Machine


A.
24
25
before


B.
100
sq ft
space saved
per elevator
after

machine room improvements

Actual 1 week old filter
with old system

Actual 3 month old filter
with new system

One DC generator has 16 carbon brushes.

We assume that one carbon brush emits 272.16 grams of carbon dust monthly. That's 3265.92 grams annually or 7.2 lbs of carbon dust annually per generator. By replacing 40 generators, we can assume that we eliminated 288 lbs of dust annually. The result? A huge reduction in the number of filters used on a monthly and annual basis due to less carbon dust in the air.

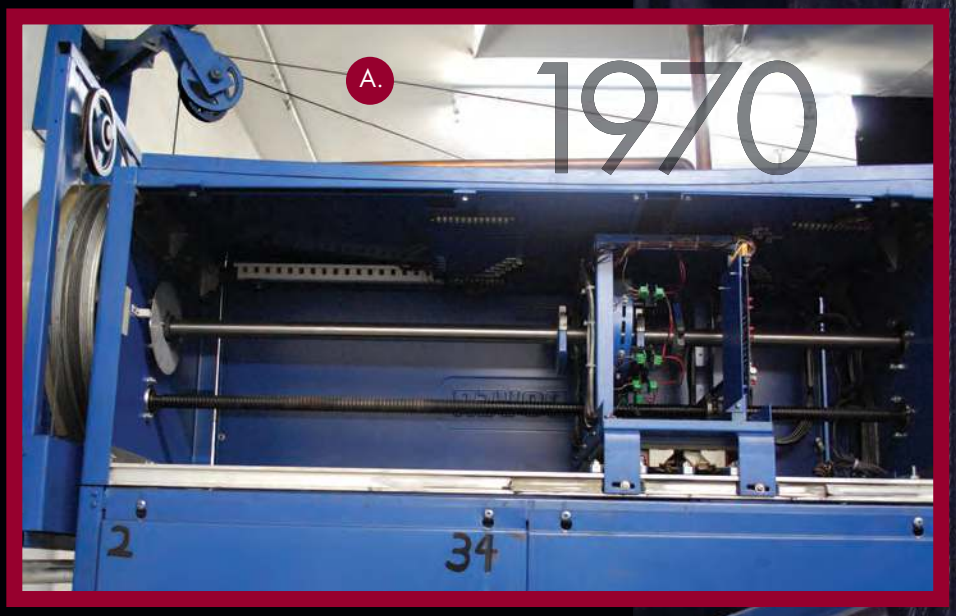
A. Former machine room

B. New recaptured space for owner's use

C. Carbon brushes in various stages of wear

car positioning

Depending on the vintage elevator, various hoistway positioning technologies have been utilized, including selector cables, hoistway tapes and solid state boards located at each floor and on the car top. These positioning technologies were used to locate the elevator in the hoistway and inform the control system. Older positioning systems required much material and lacked accuracy.



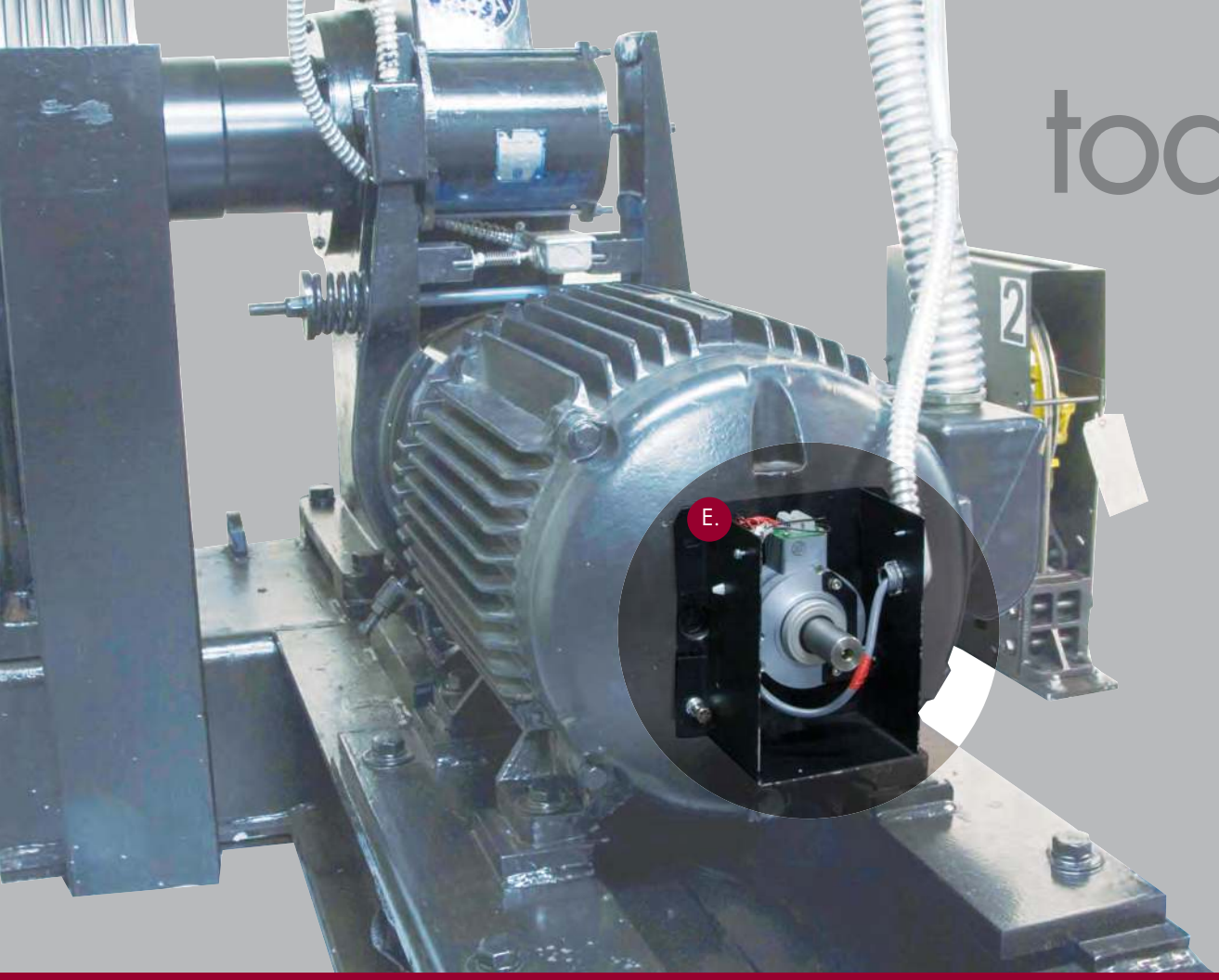
B.

C.

1985

D.

today

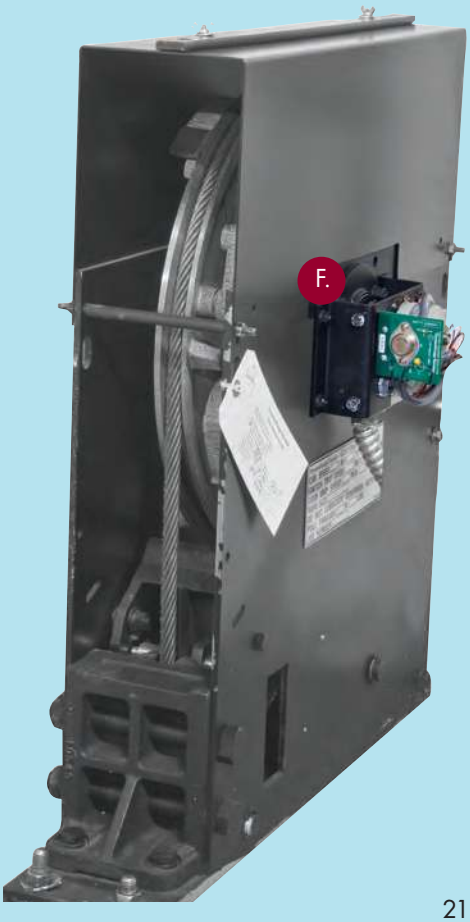


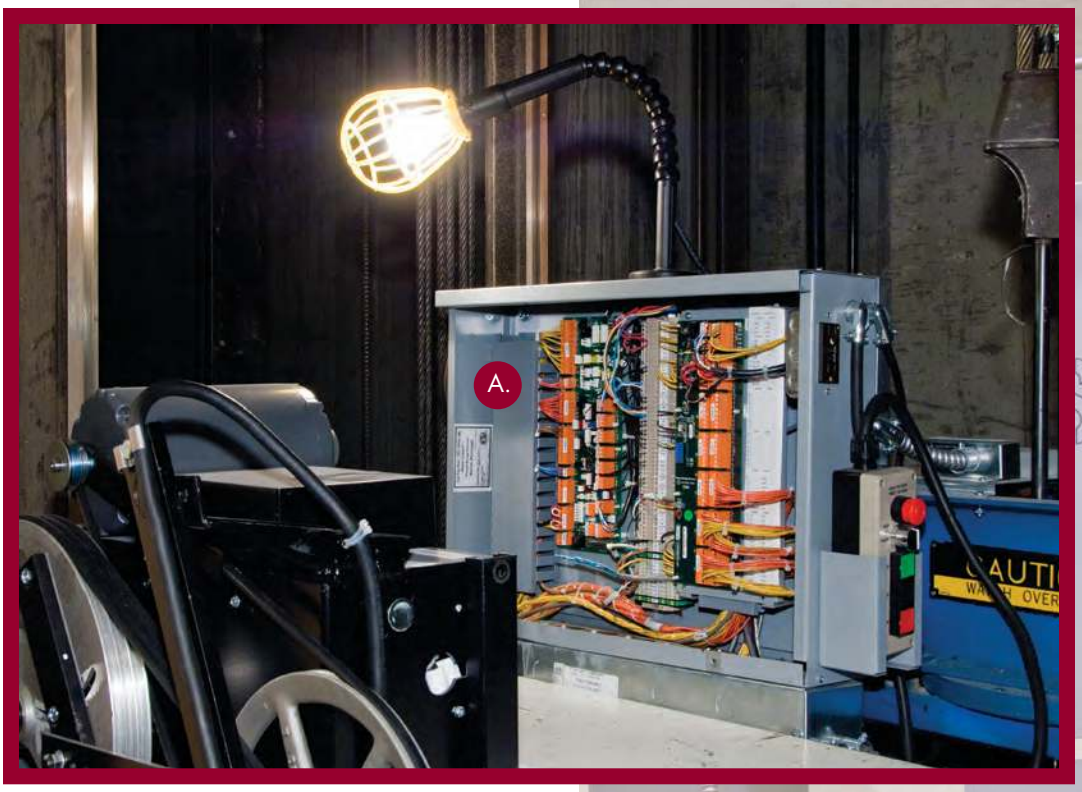
modernization

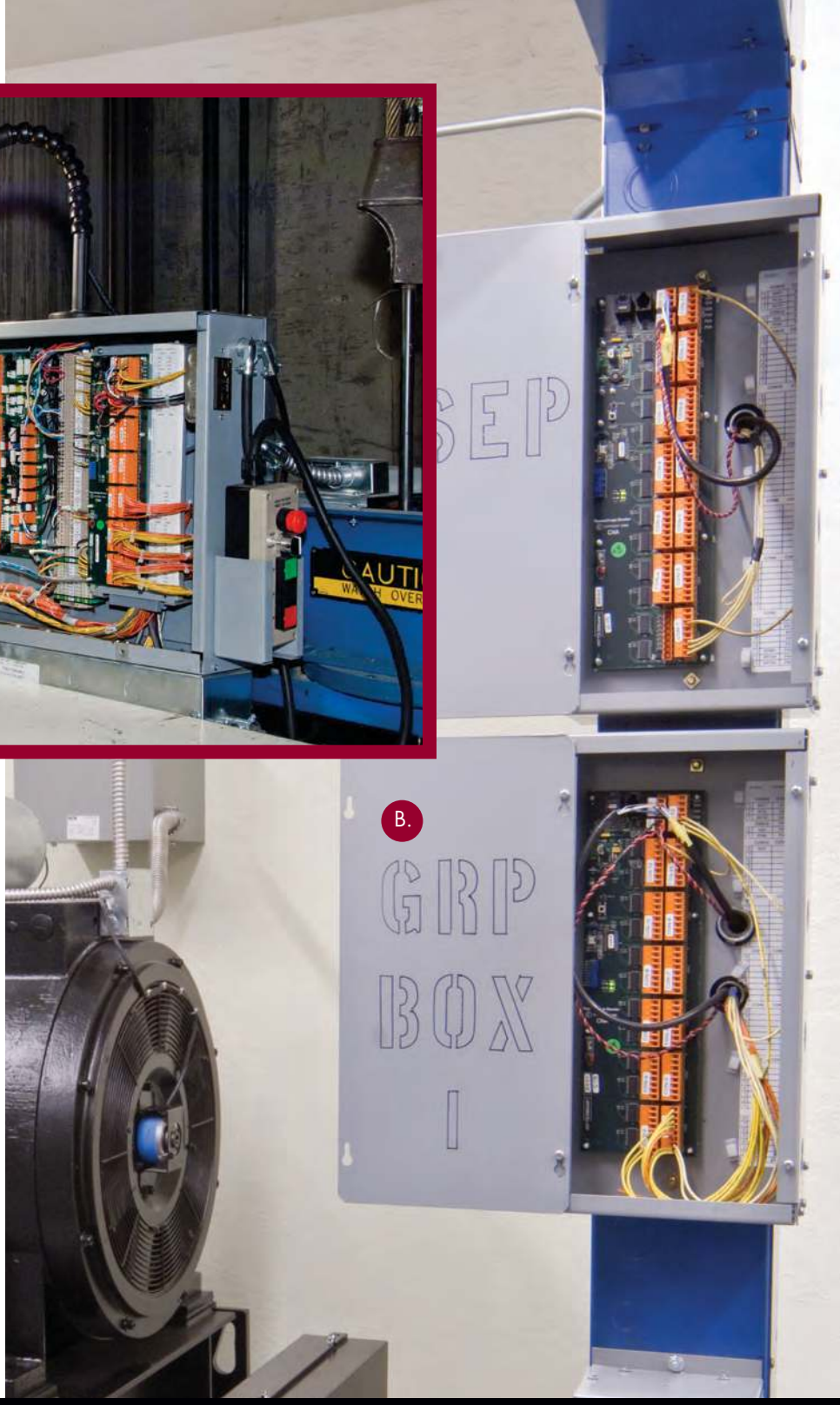
hoistway accessories

- A. Selector Cable Positioning System
- B. Hoistway Floor Positioning Box (one box at each floor)
- C. Wiring Chase (extends length of hoistway)
- D. Car Top Positioning Box
- E. Velocity Encoder
- F. Position Encoder

The TAC50M system includes two digital encoders located on the governor and machine; one for position and one for velocity. Once parameters are set on these encoders, accuracy is greater than on any other elevator system. This new technology eliminates the need for costly material in the elevator hoistway, including multiple boards, wiring chases, cables and conduit. ThyssenKrupp Elevator's new positioning system allows the elevator controller to make real-time decisions for better performance and guarantees maximum acceleration, deceleration, dispatching, leveling and other performance criteria.







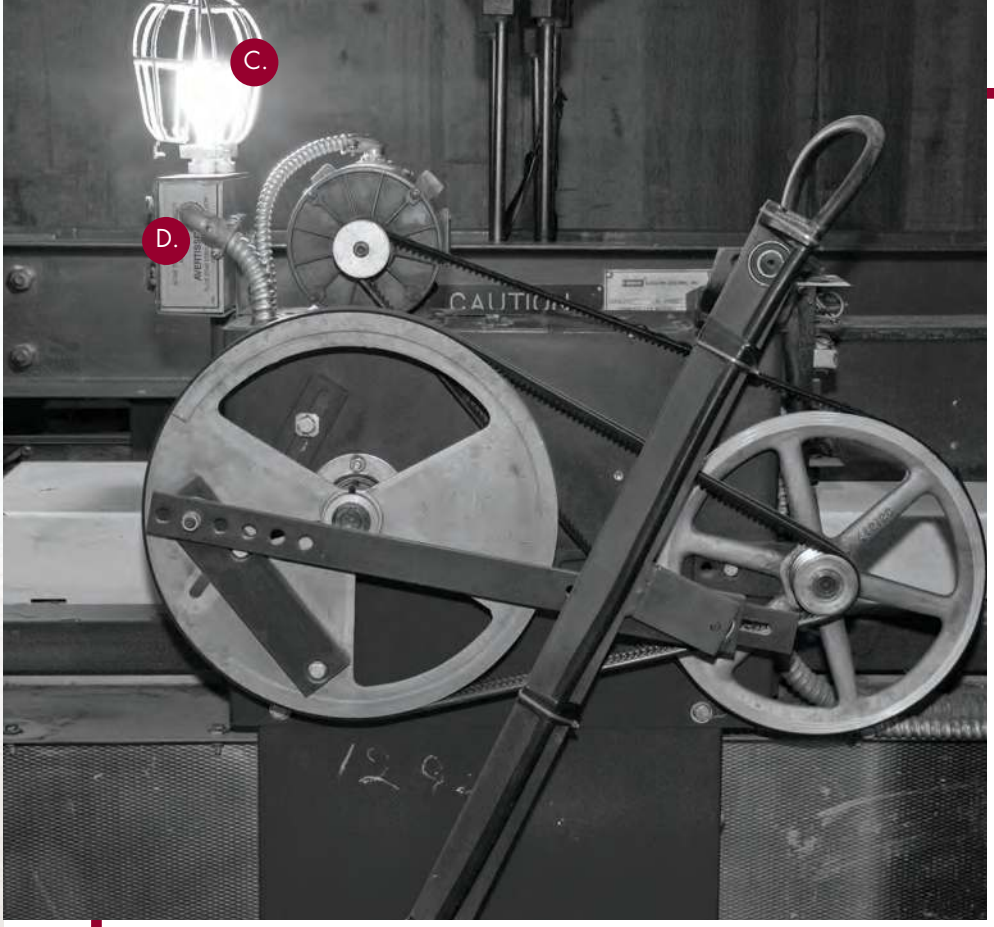
wiring improvements

By the use of strategically placed junction boxes in the elevator machine room and on the car top, ThyssenKrupp Elevator can utilize a large amount of existing wiring, thus reducing the amount of wiring needed from the control system. The number of traveling cables needed may be reduced by one or two, reducing the costs associated with and downtime needed to modernize your system, thus becoming a more sustainable solution.

A traveling cable weighs 483 grams, or 1.064 pounds per foot. Therefore, on an elevator with a travel distance of 200 feet, we could potentially remove 2 traveling cables per elevator, recovering over 400 pounds of copper per elevator.

A. Car top junction box

B. Machine room junction box



modernization

improved car top access & safety

Improvements include a flexible car top light and run/stop switch.

C. Fixed car top light

D. Hard-to-reach run/stop button

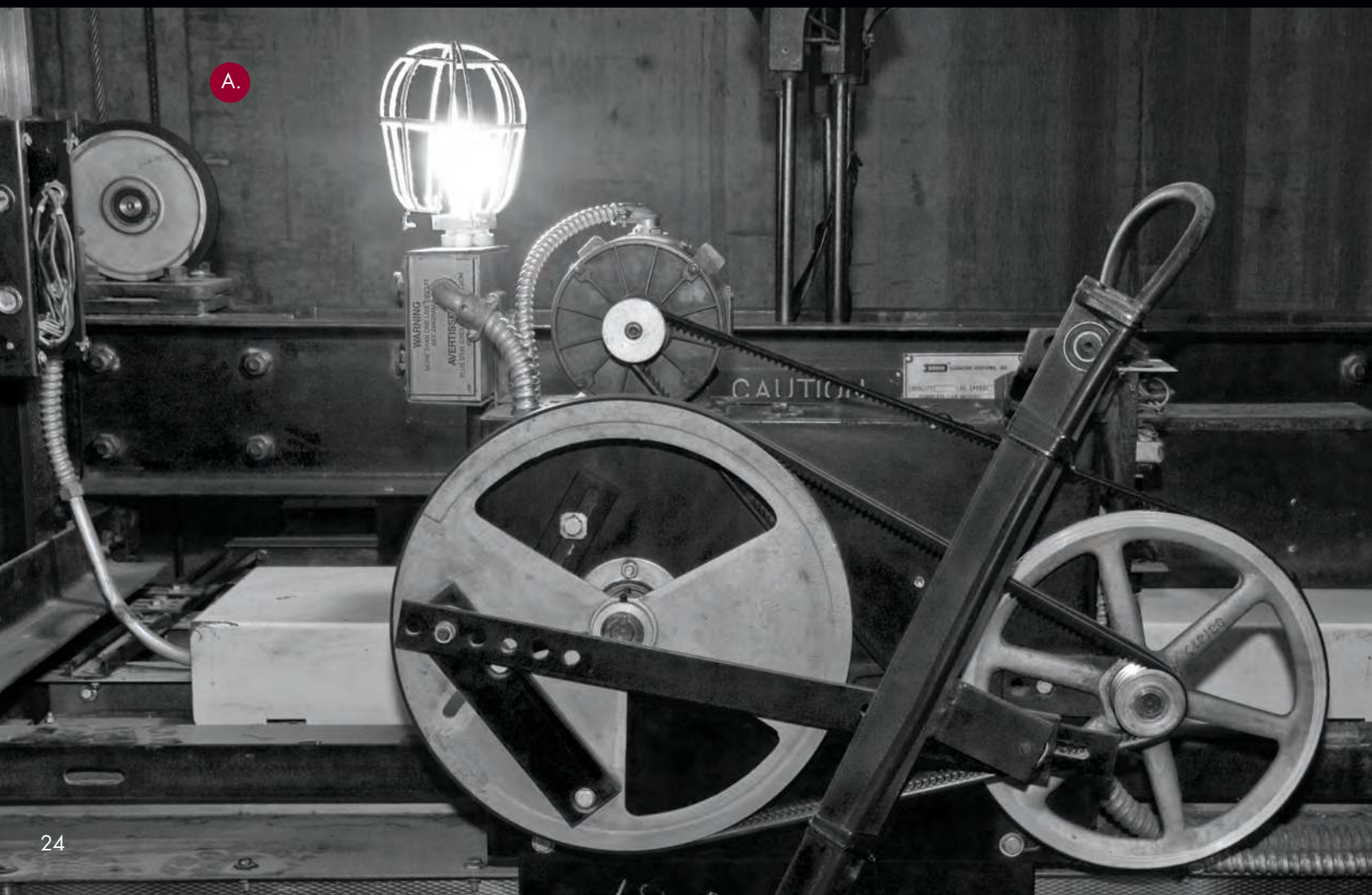
E. Flexible, movable car top light for ease of use

F. A detachable run/stop button with utility cord

on average, an elevator's doors open

1.75

million
times
in 10 years



door operator conversion

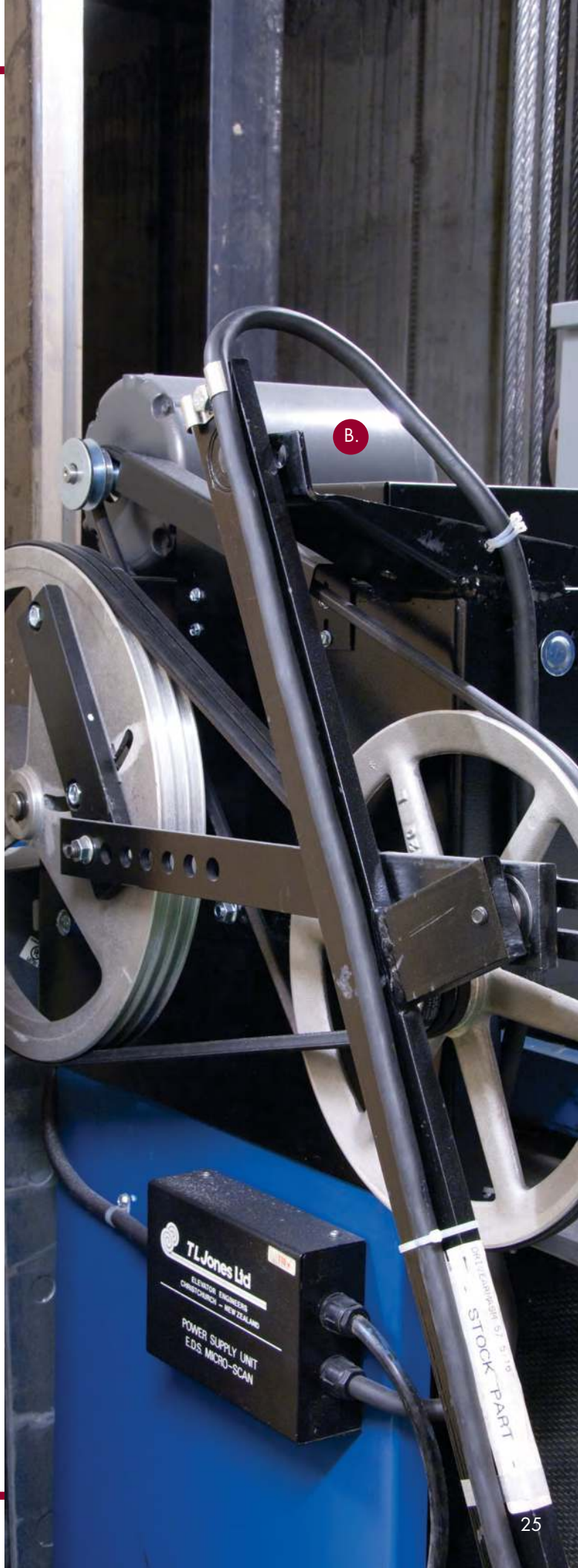
Historically, 80% of all elevator trouble calls are related to the doors and door operation. By modernizing to a new ThyssenKrupp Elevator closed loop door operator, trouble calls are greatly reduced. Closed loop technology, accompanied by a digital control system, allows for settings to overcome changes in atmospheric conditions, minor obstacles in door tracks and other door related problems. Door settings are digital and adjustable, requiring less time and effort than older systems. Door operator conversions allow for safer door operation and improvement in performance. Hanger equipment and MicroLights® may be included in the door operator conversion, as necessary.

80%

of trouble calls are door related

A. Open loop Door Operator

B. Closed loop Door Operator



load weigher

With ThyssenKrupp Elevator's new TAC50M controller comes the most sophisticated loadweighing equipment on the market. Our loadweigher, located on the cables that are attached to the top of the car, can detect changes in weight as slight as 15 pounds. This enables the controller to make dispatching decisions based on occupancy in the elevator, improving elevator performance. As an option, ThyssenKrupp Elevator can provide mass detectors in addition to the loadweighing device, which are able to recognize space-filling mass such as suitcases, money carts and boxes. The new loadweigher replaces older systems which were previously located under the elevator platform. These older systems were subject to loading deflection in different areas of the elevator cab. This is just one of the innovations in our new control system.

detects a change as slight as

15 lbs

modernization destination dispatch

ThyssenKrupp's Destination Dispatch system is just one more intelligent feature available with the TAC50M. Whether you choose to have Full or Boost operation, Destination Dispatch reduces overall trip time for passengers by allowing them to designate the floor they want before the elevator actually arrives. A kiosk then directs passengers to the elevator that will get them to their destinations the fastest, reducing trip times and increasing handling capacity by up to 30%.

full destination operation

With Full Destination Operation, kiosks are provided throughout the building for optimum dispatching of passengers—all day, every day. Passengers utilize kiosks rather than typical car and hall fixtures. Destination Dispatch results in increased handling capacity, reduced overall trip times and less crowding in the elevators.

boost operation

With Boost Operation, the Destination Dispatch kiosks reside at one or two "main" lobby levels to assist in transporting passengers throughout the building quickly and efficiently during heavy traffic times; such as, early morning arrivals, lunch and afternoon departures. When Destination Dispatch kiosks are not in use, the elevator will operate using optimal Estimated Time of Arrival (ETA) dispatching via typical car and hall signals.

destination advance

Destination Advance is beneficial during the modernization process because Destination Dispatch can be activated during the early stages of a modernization project. During the modernization, Destination Advance will assign hall calls to both the modernized and existing elevators, providing improved dispatching while an elevator is out of service for modernization. This avoids the traditional decrease in handling capacity during a conventional modernization.

sustainability

At ThyssenKrupp Elevator, we understand that the world's resources are finite. As global health and prosperity continues to expand in parallel with the growing population, the demand for natural resources perpetually increases. Therefore, in order to preserve the future quality of human life on this planet we must seek both economic vitality and a healthy, sustainable natural environment. ThyssenKrupp Elevator is committed to seeking innovative ways to reduce our consumption of resources in everything we do. Our vision is simple. Waste nothing! Our goal is to recognize and appreciate that every resource that is available to us has a significant value. Resources are more than just the tangible commodities that we buy or produce. Resources include our people, our communities, our planet and our prosperity. Through this culture of valuing each resource as precious, we understand that inefficient use of resources is not an option.

We are continually looking for ways to reduce our environmental impact through perpetual conservation of materials and processes. Our responsibility goes beyond our own environmental footprint. Through a critical life cycle analysis of our elevators, we have identified that once installed and operational, the energy consumption (although less than a few dollars a day with newest technology) has the most significant environmental impact in relation with the life of a building.

We have made great strides throughout the evolution of vertical transportation by staying current with the most efficient drive and controller technology available. Our newest drive, machine and controller technology offers enhanced ride performance and over 70% improvement in energy efficiency when compared to equipment installed decades ago. Although we can say that this is a testimony to our innovative ways, it also presents an opportunity to look back and discover innovative ways to bring older, less efficient elevators up to current safety, health and efficiency standards.

Environmentally-friendly modernizations use less materials and resources, improve and protect indoor environmental quality and deliver the highest levels of energy efficiency. That's ThyssenKrupp leadership through sustainable actions!

Brad Nemeth
Director of Sustainability


70%
improvement in
energy efficiency

ThyssenKrupp Elevator
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