

## Ground-Breaking Boom Lifts

Genie builds first AWP's with a completely mobile, self-contained AC drive system.

By Guy Ramsey

Genie's 40-foot Z-40/23N RJ narrow articulating boom lift

When Genie Industries, Redmond, Wash., identified the need to produce a machine to compete with the JLG E400A Narrow, the company recognized that the height and reach capabilities of its competitor were about as far as a narrow chassis machine could go. "We couldn't do anything about the laws of gravity," said Glen Bowser, director of product management.

Accepting this reality meant that if Genie wanted to avoid producing a "me-too" machine, it would have to look at other ways to leap frog the competition. Long known for its pioneering mentality, Genie designed its 40-foot Z-40/23N and the Z-40/23N RJ narrow electric articulating boom lifts to compete in this segment but added a new twist. These models are the first-ever self-propelled aerial work platforms to use a totally mobile, self-contained AC drive system.

The idea to engineer a product with this capability had been on the minds of Genie's engineers for some time, and about two years ago, they took a standard Z-45 and adapted it with an AC drive system. This test mule has been working and proving itself around Genie's facility ever since.

### New AWP technology

With the exception of the multi-directional, 4-foot rotating jib on the Z-40/23N RJ unit, these machines are identical. Each unit features a 40-foot maximum platform height and a 23-foot maximum horizontal reach, while riding on a 4'11" wide base and weighing in at about 15,300 pounds.

Structurally, these new models utilize a lot of current product components. For example, the chassis is the same as the one used on the Z-45/25 – the only difference in this case being that the Z-40/23N models don't offer an oscillating axle. However, what distinctly separates these additions, not only from every other Genie product but all other AWP suppliers, is the AC drive system.

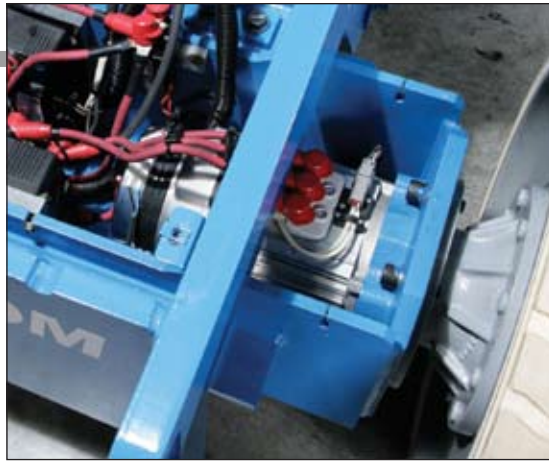
Although new to the access industry, the technology applied to the Z-40/23N's AC drive system has been successfully utilized in industrial forklifts for many years. According to Phil Harvey, Genie's boom product manager, the key to success is the ability to convert the conventional 48-volt DC power supply to a more efficient three-phase, 34-volt AC current. Genie tabbed the leader in AC conversion and control technology, Zapi, Inc., Cary, N.C., to accomplish this.

While there is some efficiency loss when inverting DC to AC, the gains in system performance far outweigh any loss in the process. Genie's engineers explained that AC power is more efficient than DC because it draws the most precise amount of power required to perform a task. Once converted, the AC current drives a pair of fully sealed, three-phase, brushless permanent magnet motors.

Supplied by ABM Greiffenberger Antriebstechnik GmbH of Germany, these motors are IP54 rated, which means they are sealed against dust, and they are water resistant. Keep in mind that while the motors are very tolerant of water, they are not intended to take a direct blast from a high-pressure or steam cleaner. However, this shouldn't be a problem since they are sheltered in a steel enclosure.

Because the Z-40/23N units combine the use of both an AC drive and DC-controlled and driven functions, Genie went looking for a controller solution. The answer was the Sauer-Danfoss Plus-1 control system, which Genie likes because its own in-house software engineers can customize the system to fit its needs.

In total, there are seven individual microprocessors working together in the control system. Communication between these controllers is sent over a CANbus system, which allows coded information to travel over a pathway that links all seven microprocessors via a single pair of wires – similar to those used for a standard household phone line. Doing this not only reduced the number of wires required



Sealed AC drive motors are void of vent openings.



The display screen may be moved inside the upper control box, and a standard Genie battery level indicator may take its place.

for the added number of controllers, but it also reduced nearly 60 percent of the number of wires typically used for a more traditional Genie control system.

### AC system benefits

One performance advantage designed into the AC drive is the speed of each motor can be infinitely controllable. Working in conjunction with wheel-mounted RPM sensors, the computer adjusts the motor speed to compensate for the variation that occurs when the machine turns a corner or one of the drive wheels loses traction. Not only does this reduce the scrub, but it also allows for a tighter turning angle. Steering wheels now achieve a 57° turning angle, which delivers excellent inside turning of just 2'11".

Other features of the AC system include regenerative braking and a much faster drive speed at 4.5 mph. Though not as important as drive speed, the AC drive also produces more torque, which improves the gradeability. Instead of spring-applied hydraulically released brakes, the Z-40/23N units have spring-applied, electrically released brakes,



The DC-powered hydraulic system now utilizes a high-pressure filtration system.

which eliminate one hydraulic circuit in the base of the machine.

### Company firsts

For the first time on a Genie boom lift, the Z-40/23N units will have a vastly more efficient, hydraulic-function control system. Hydraulic flow to power the boom and steering functions is now supplied by a variable-speed DC motor. Utilizing a motor controller, the units' speed is adjusted by a simple rheostat control dial.

The new hydraulic system is also designed to provide true multi-functionality. Select a function, and you get dedicated flow until a second or third function is selected. If flow demand ever exceeds pump output, all selected functions meter back. Flow is then distributed to those functions at the same proportion.

Another first for a Genie electric boom lift is the use of a high-pressure filtration system. In the past, the company relied on a low-pressure return-line filter. Because the new valving system is a little more sensitive, a Hydac-supplied canister (see image at top) also has been incorporated. The canister features a sensor that can signal the control system when it needs servicing, and the machine owner can customize what the system chooses to do with this signal.

### Meeting expectations

Aside from the new drive and control systems, the Z-40/23N and Z-40/23N RJ offer all the features and benefits you would expect from Genie. As you can see in the platform



Improved wheel speed control allows for a 57° turning angle.

## A New Take on Stability



Introduced the same time as Genie's Z-40/23N models, the new 32-foot-tall GS-3232 scissor lift's development was driven by the opportunity to expand upon proven products and technology in new applications. Ninety percent of the parts used on the new GS-3232 are pulled from existing products. The 500-pound capacity platform and chassis are common to the GS-2032 and GS-2632, and the links, or scissor, stack is borrowed from the GS-3246. The operating system is common to both products. However, the GS-3232 incorporates a new automatic-leveling hydraulic outrigger system. This 32-inch-wide machine can not only pass through a



**Although Genie calls them outriggers, they actually are fitted inside the frame to the rear of each wheel.**

standard doorway, but the self-leveling system also enables it to work on sloped floors.

It is important to point out that while Genie calls them hydraulic outriggers, they actually do not protrude outside the frame of the machine. As you can see in the image at the bottom, they are fitted just to the rear of each of the four wheels. Since they do not stick out, they would be more appropriately called downriggers.

Operating the automatic-leveling system is fairly simple. Starting with the downriggers in the stowed position, the operator sets them in place by utilizing the secondary panel that has been added to a standard control box, which is the same as those found on all electric GS models. At the same time the operator sets the downriggers in place, the self-leveling system signals that the unit is level. Once the four status LEDs — located on the extra panel — are lit green, the deck can be raised.

A key part of the automatic-leveling system is the pressure transducer. Used in place of a limit switch, the pressure transducer inside the hydraulic system senses the pressure on the non-marking pads added to the downriggers. Until pressure is sensed on each one, the transducer will not allow the machine to elevate.

The GS-3232's self-leveling outrigger system works on slopes of 5° side-to-side and 3° front-to-back. The ability to work on an uneven floor opens the machines up for a wide variety of applications, including movie theaters, churches, and virtually any other area where the floor is sloped for drainage.

Make sure the machine is in the proper location before elevating. If the platform is not at the correct work point when elevated, then the operator will have to return all the way to the stowed position and retract the outriggers to reposition the lift.

With the downriggers fully retracted, the 5,100-pound GS-3232 can be driven with the platform elevated up to 22 feet. Other key points are the 25 percent gradeability, which is excellent for a machine of this size and weight, and the 30 percent outrigger approach angle. As with all GS products, the inside turning radius is zero.

Users may expect a scissor lift this narrow and goes up to 32 feet to be a little on the wobbly side — but it isn't. Most likely, this is due to the fact that the scissor stack was originally designed for the wider GS-3246. Stability could also be attributed to the rigid base that the four-point downriggers provide.

Key accessories and options on the GS-3232 include a platform laser light, which helps to line the platform up with overhead work, an 800-watt inverter, dual flashing beacon, motion alarm, power and air lines to the platform, and platform work lights.



**Operators set the outriggers via a secondary panel on the control box.**

operational controls are Genie's standard package (see image on page 27). The display screen in the middle of the panel is a system status screen, which supplies alpha/numeric-based status reports and fault messages in a variety of languages. The screen may move inside the upper control box on future production models, leaving a simple battery charge indicator in its place. Of course, Genie's drive-enable safety system is standard to prevent operators from becoming disoriented when driving the machine after rotating the turntable.

The standard 500-pound capacity platform on the Z-40/23N is 4'8" wide and made of steel, while the RJ uses a narrower 3'10" platform. The narrow platform is also an option on the Z40/23N. Steel wheels ride on non-marking, rubber-mounted tires.

The Z-40/23N RJ comes with a 4-foot jib that not only delivers 130° vertical range of motion, but it also rotates 180° horizontally. Turntable rotation is limited to 355° non-continuous.

Both machines also have the normal 24-volt DC auxiliary operation system and a battery

charge indicator. If the indicator is ignored, a low voltage interrupt will keep the machine from burning out any fuses. Located on both sides of the base are swing-out battery packs that each holds four Trojan 350 Ah batteries. The test machine was also equipped with an optional 800-watt power inverter to supply AC power to the platform.

Genie has an array of options and accessories available on the all-new Genie Z-40/23N machines. Information on these add-ons can be found at [www.genieindustries.com](http://www.genieindustries.com). ■