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D155AX-6 sports new blade design, undercarriage

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Cover photo by George Pfoertner ©

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COVER STORY: Field Test

38 Powerful New Dozer Has Good On-Site Numbers

Komatsu's new D155AX-6 crawler dozer went blade-to-blade with its D155AX-5B predecessor on a recent field test. Senior Editor Walt Moore says the Dash-6 is a significantly different tractor, and it features the innovative Sigmadozer blade.



PREVENTION ILLUSTRATED

48 The Electrical Schematic Is Your Friend

A step-by-step guide shows you how to read truck and machine electrical schematics competently. Four basic rules include: 1. Read first to learn how the circuit works, then redraw to troubleshoot. 2. When tracing a circuit, always work from the load to the battery. 3. There is usually only one load component per circuit. 4. Use every clue the manufacturer gives you.



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52 Managers Are Trained, Not Born

No longer is it enough to focus just on the mechanical aspect of fleet operations. Fleet managers now have to be versed in asset-management skills such as finance, long-range planning, determining equipment lifecycles, and integrating the latest computer technology.



HANDS-ON TRUCKING

65 Terex Mixer Shows Concept's Advantages

Front-discharge concrete mixers have been around for more than 40 years, but they are not used in many markets, so they might seem foreign to many folks in the construction industry. Truck Editor Tom Berg drives this Terex mixer and comments on its good visibility, decent maneuverability, Allison automatic transmission, three-section instrument panel, and Wide Workspace cab that includes a fold-up second seat for training purposes.



BUYING FILE

72 New Asphalts Ache for Pneumatic Rollers

Today's asphalt mixes and road designs are conspiring to make something of a hero out of the pneumatic-tire roller. The rubber-tired compactor is a specialized tool, making up less than 15 percent of all rollers working in the United States, according to the 2003 *Construction Equipment* Universe Study. The compactor's role in highway paving is becoming crucial, working with challenging Superpave mixes and meeting tough compaction specifications.



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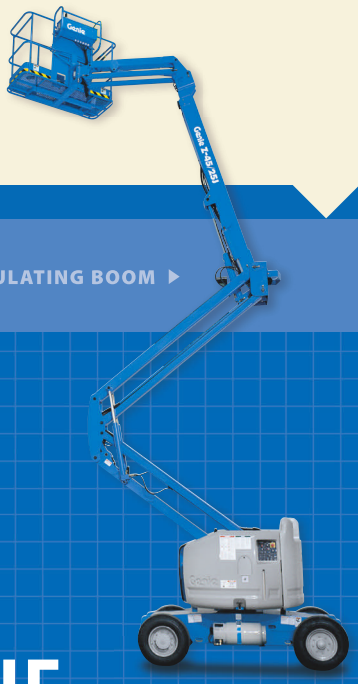

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Buyer's Source Book

Twenty years ago, *Construction Equipment* launched a new directory of machine specifications called *Construction Equipment*'s Specifications Guide. We moved it online when we launched our website about 10 years ago, and it has resided there ever since.

Keeping those specifications up to date, however, was a chore that eventually outgrew our ability to maintain the high standards for which *Construction Equipment* is known. We contracted with Spec Check for some years, and to quote a famous shaver commercial, "we liked them so much we bought the company."



Rod Sutton, **Editor in Chief**

After six months of working alongside Mac Wilcox and Bill Borthwick, the heart and soul of Spec Check, there is no doubt in our minds why the quality of those machine specifications ranks so high. They devote all their time to tracking down, normalizing and analyzing construction-equipment specifications. Their expertise is acute.

Later this month, we'll be back in the print arena with a guide to equipment specifications. But we have again improved upon what has always been a great idea for equipment buyers and specifiers. We are combining our Specifications Guide with our industry-leading Buyer's Guide, a compilation of manufacturers and their dealers, along with a listing of rental chains, industry associations and service providers.

Online, ConstructionEquipment.com provides real-time resources for equipment buyers, providing specifications, manufacturer and dealer listings, and our editorial archives of machine evaluations and management information. The beauty of the website is its ability to renew itself. Mac and Bill update the specifications database monthly, and the editorial database grows after each issue of the magazine.

And our new print resource, aptly titled Buyer's Source Book, is the natural complement to that web-based resource. The need to acquire a machine, and the subsequent need to do some research on that acquisition, doesn't always occur near a desktop with Internet access. Sometimes your resource has to be in print.

Watch for the new Buyer's Source Book to come at the end of August. If you want to order an extra copy, please call 1-800-446-6551. And find a safe place to keep it; there's a ton of useful information between its covers.

Rod

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MARKET WATCH

By KATIE WEILER, Managing Editor

Access our online reader response form at ConstructionEquipment.com/info. Just key in the issue date and make your selections. Subscribe to our monthly eNewsletter at ConstructionEquipment.com/subscribe.asp.

Bobcat



V638 VersaHandler from Bobcat moves and places materials as high as three stories. It has a maximum load capacity of 6,700 pounds and a three-stage boom with a maximum lift height of 38 feet 11 inches. Hydrostatic transmission means that operators can shift from low to high speeds "on the fly." The inching pedal controls travel speed at any rpm and reduces wear on disc brakes, says Bobcat.

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JCB



JCB first introduced it "Auto" range of hydraulic excavators in 2003 and is now expanding this lineup with five new crawler models. Included in this recent launch are models JS330Auto, JS190 Auto, JS145 Auto, JS130LC Auto, JS115 Auto and JS175W (wheeled) Auto. The models vary in operating weight from 33 to 11.5 metric tons, and in horsepower ratings from 285 to 90.

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Caterpillar



Powered by the C7 ACERT engine, the 525C, 535C and 545C wheel skidders replace B-Series models. Redesigned grapples feature a strong box-section design and higher clamping forces for faster log loading and optimal retention. Auto-Grab monitors and adjusts tong pressure as needed. Large engine doors provide access to service points. Horsepower ranges from 182 to 219. Grapple sizes range from 12.5 to 19 square feet.

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Case

E Series wheel loaders allow operators to match power and fuel economy through a choice of three power curves and four work modes. Three models were introduced: 721E, 721E/XT and 821E. They have Tier III six-cylinder, 6.7-liter Case engines with 183 and 213 net horsepower, respectively. Operating weights: 30,644 pounds, 31,574 pounds and 37,844 pounds. Bucket capacities: 3.10, 3.0 and 3.78 cubic yards. Also included is a new cab and features designed to improve maintainability and serviceability.

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Market Watch

JCB

Models 8040ZTS and 8045ZTS, both with zero-tail swing, weigh in at 9,480 and 10,472 pounds, respectively. The machines use a 46-hp, Tier-2-compliant diesel engine and provide digging depths of 10 feet 11.5 inches and 11 feet 7.5 inches, respectively. They also feature load-sensing hydraulic systems.

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Schwing America

Truck-mounted KVM 39X concrete pump with Generation 2 detachable boom has a new boom design that offers lighter picking weight and faster mounting for jobs requiring a separate placing boom. Generation 2 allows a 13,200-pound picking weight for the 114-foot boom, which can be mounted in many ways.

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Iowa Mold Tooling

A new line of electric telescopic cranes are designed for lighter lifting applications. Models 2003i, 3203i, 4004i and 6006i range in capacity from 2,000 to 6,000 pounds and can be mounted on the company's Dominator service vehicles. Maximum reach ranges from 7 to 22 feet.

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Bomag

Two pneumatic-tire compactors, the 99-hp BW24RH and the 131-hp BW27RH, replace model BW24R. They feature hydrostatic drive and two-point pivot steering, providing seamless speeds up to 12 mph. Pivot-steer provides "sequenced" steering, allowing inside and outside tire pairs to turn at different rates for protecting the mat. The BW24RH's fully ballasted operating weight is 52,911 pounds; the BW27RH is 59,525 pounds.

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John Deere

The 27D excavator, with standard operating weight of 6,400 pounds, incorporates numerous features that enhance its production capability. Among those features are increased operating speed (cycle times are reportedly 18 percent faster), 50 percent more drawbar pull and automatic shifting between low and high travel ranges.

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Liebherr

The A 954 C, which replaces its B-Series counterpart, uses a new Tier-3 engine, carries more weight and has increased lifting power. It has a massive undercarriage that is wider, longer and heavier — resulting in greater stability when handling long attachments. Equipped with a 34.5-foot, straight boom, 25.6-foot stick and 1.8-cubic-yard grapple, this scrap handler weighs in at about 166,000 pounds.

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Sennebogen

821 Series is available as a wheeled model (821M) or a crawler model (821R). Operating weights are 54,000 and 51,600 pounds, respectively. According to Sennebogen, the models are "equipped with one large hydraulic axial-piston pump and a 'computer-free,' load-sensing hydraulic system."

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Hitachi

Zaxis Dash Three excavators feature redesigned cabs that boast more legroom and visibility. The series includes ZX240LC-3, ZX270LC-3, ZX350LC-3, ZX450LC-3, ZX650LC-3 and ZX850LC-3. Enhancements include Tier 3 engines, faster hydraulics, and "beefier" undercarriages.

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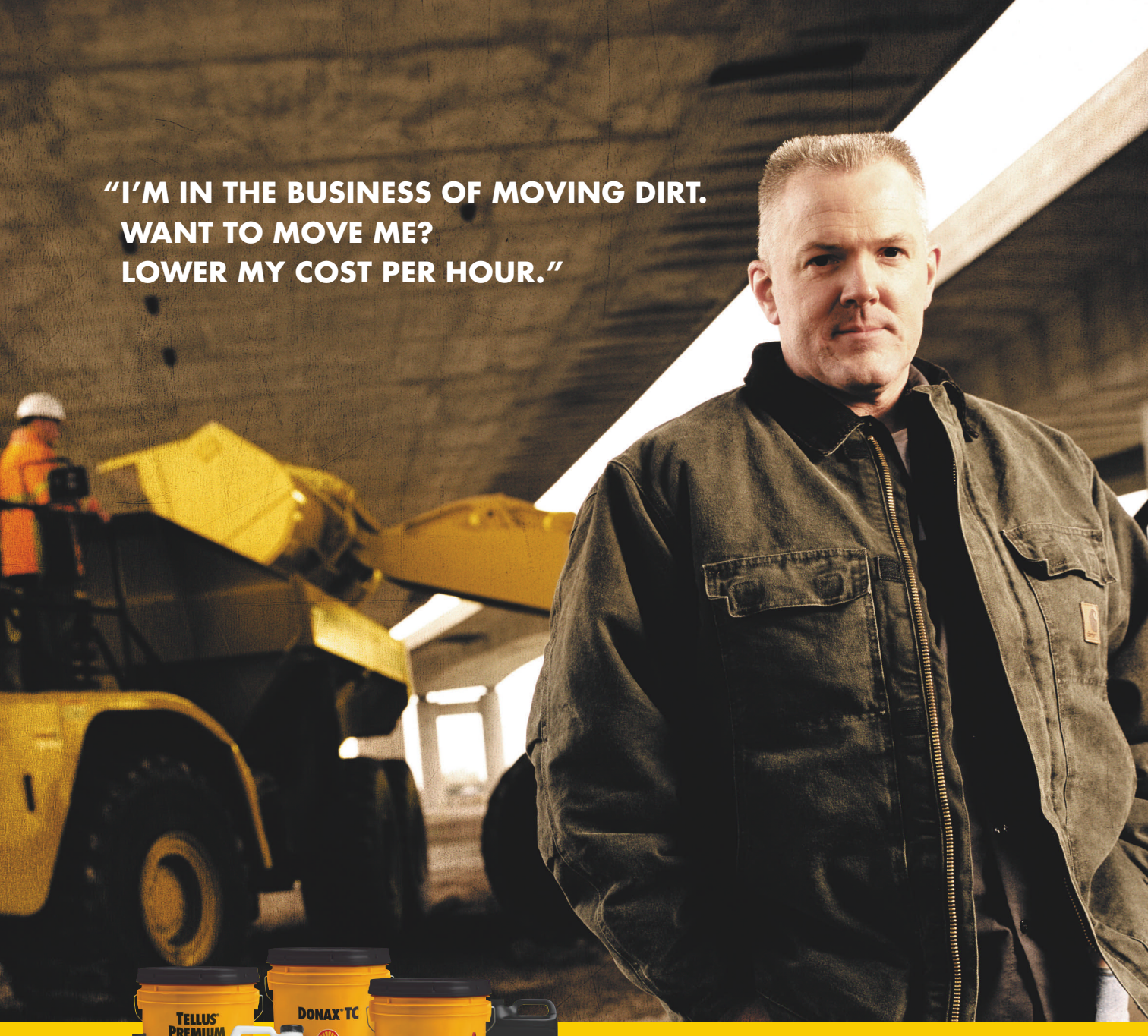



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Market Watch

Case



With an operating weight of 153,400 pounds, the CX700 excavator digs to 31 feet 11 inches and reaches 46 feet 11 inches at ground line. It is powered by a 425-hp (net), Tier-3 Isuzu engine. Equipped with four work modes and an automatic power-boost system, it is also equipped with a switch-activated system that allows hydraulic priority to be given either to the boom or swing circuit.

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Titan

If you need to haul more per load, or if you need to haul two different loads with the same truck to different destinations without unhooking, the new Walk-Through B-Train Aluminum Live-Floor trailer may have potential. This 62 foot-8 inch, thin-wall-aluminum trailer configuration can be top-loaded, baler loaded or compactor loaded, and with a live floor and a hydraulic system that brings the two trailers together, unloading possibilities are increased.

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Sennebogen



The 305 Multihandler Series-C is billed as the first telehandler with a hydraulically actuated high-rise cab (with an eye-level height of 13.3 feet) and the capability to attain a lifting height of 24 feet. With the optional two-part XL telescopic boom, lift height is 30 feet. The load-bearing capacity of the 100-hp machine is slightly more than 11,000 pounds.

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Vermeer

The BC1400TX brush chipper is Vermeer's first with a track undercarriage. Options for the undercarriage include a rubber-over-steel version or steel triple-grouser tracks. The 122-hp machine processes wood to 15 inches in diameter and comes with a SmartFeed system to increase productivity. SmartFeed automatically stops or reverses the feed rollers if the engine loses rpm.

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Market Watch

Compact Power



Five trailer packages are available for the company's mini-skid loaders, including Boxer, Brute and Kanga lines. The trailers are designed to house a variety of attachments (up to 10), while leaving ample room to maneuver the mini-skid on and off the trailer. The new trailers can be towed by a ½-ton pickup truck.

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Peterbilt

Peterbilt has redesigned its heavy-duty vocational trucks with a larger cooling package for 2007 diesels, and renamed them. The 357 and 378 will be replaced by the 365 (left) and 367, both available with setback and forward-set steer axles and a variety of axles and other chassis components. The 365 has a 115-inch BBC, and will be available with 9-, 11- and 13-liter Cat and Cummins diesels. The 367 has a 123-inch BBC and will come with 15-liter engines.

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Diamond Z



DZT 8000 tub grinder has a short, compact design for onsite mobility and stability. A one-piece frame houses a 60-inch hammermill for capacities up to 100 tph for stumps, logs or pallets; and 95 tph for brush. Weighing 75,000 pounds, the unit fits in the company's line between its 60,000- and 99,000-pound models.

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Terex

Four new motor graders range from 25,353 to 46,297 pounds and are available in tandem and all-wheel drive. Models TG110, TG150, TG 190 and TG210 have blade geometry that allows 90-degree positioning on either side of the machine. The frame articulates 30 degrees, and graders have hydraulic front-wheel steering. Power plants range from 132- to 220-hp Cummins Tier-3 diesels with direct injection.

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Market Watch



Terex

Pegson 1165 HR "M" single-toggle jaw crusher offers hydraulic-overload protection and hydraulic setting adjustment. According to the company, the unit features maximum seal life and crushing efficiency; high output and excellent reduction capacity; as well as good fuel economy. It has a high swing jaw that reduces the risk of blockages. It is powered by a Cat C-9 engine.

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Komatsu

WA500-6 and WA360-6 wheel loaders feature components engineered by Komatsu, including engine, torque converter, transmission, hydraulic units and electric parts. Operating weight is between 71,585 and 74,010 pounds for the WA500-6 and 38,760 and 39,260 pounds for the WA360-6. Both loaders are equipped with the Komtrax fleet-monitoring system.

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Putzmeister

The BSF 61-Meter has the smallest outrigger footprint in its class thanks to its standard OSS (One-Sided Support) outrigger system. When activated, the unit can operate in a working envelope that requires only a 22 foot-6 inch front and 24 foot-7 inch rear outrigger footprint. The pump features a four-section roll-and-fold boom to provide a 197 foot-2 inch vertical and 183 foot-9 inch horizontal reach.

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Extec Screen & Crushers

Three new crushers include the C12+ Tracked Jaw Crusher, I-C13 Tracked Impact Crusher and X44-SBS Tracked Cone Crusher. The C12+ features a Cat ACERT engine, extended tail conveyor, Vogel central greasing system, and a "Copperhead" bearing-wear management system from SKF. The C12+ offers many of the same features the C-12 has.

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INDUSTRY NEWS

Don't Blink Your Eyes!

If you do, you'll probably miss seeing the DIESELMAX, a sleek, 29-foot-long, 3-ton "diesel streamliner," with which JCB will attempt to break the "FIA, class-10, supercharged diesel streamliner" record, which now stands at 235.756 mph. (FIA is the Federation Internationale de L'Automobile, the governing body for worldwide motor sport.)

Powering DIESELMAX are two, 750-bhp, two-staged-turbo diesel engines, based on JCB's four-cylinder, 4.4-liter diesel engine (the 444) developed for use in construction machines.

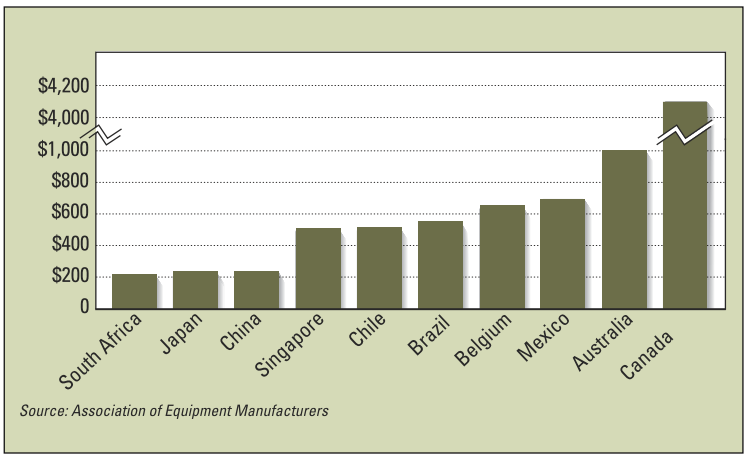
RAF pilot, Andy Green, who set the first-ever supersonic land-speed record at 763.035 mph in 1997, will drive the DIESELMAX. Although it is not designed for supersonic speeds, it is said to be twice as fast as a Formula 1 car. The record attempt will take place at the Bonneville (Utah) Salt Flats in mid-August.



The engines in the DIESELMAX are based on JCB's 444 off-road diesel, which, according to the company, required five years and $140 million to develop.

EQUIPMENT STATS

Top 10 Countries for U.S. Exports (Exports, in $ millions)



Source: Association of Equipment Manufacturers

Exports of American-made machinery totaled $12 billion last year, according to the Association of Equipment Manufacturers. Exports to Asia rose 33 percent; Europe and Canada each increased by 35 percent; and Latin America rose 51 percent.

MANUFACTURER NEWS

Volvo Launches Telematic Tool

After testing on several continents, Volvo unveiled the first iteration of its telematic, remote-machine management system. CareTrack exchanges information over a wireless network to monitor machines in the field. It will use a combination of satellite and cellular systems to transmit machine location and use information to a secure website machine owners can access with a password.

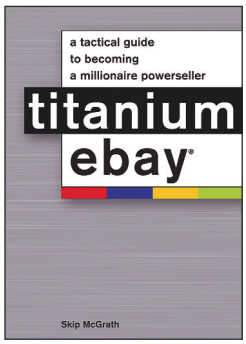
Volvo developed CareTrack, making it the only system able to interact with Volvo's on-board diagnostic systems. Information on how much fuel a machine uses, when and how it is used, and error codes generated by on-board diagnostics can all be captured without needing to be on site.

CareTrack can restrict how many hours of the day a machine works and where it goes, allowing owners to set timers or virtual "geofences." If the machine exceeds these boundaries, CareTrack sets off alarms or immobilizes the machine to stop unauthorized use.

CareTrack reports location, fuel consumption, work and idle time wirelessly from locations all over the globe.

RESOURCES

Sell on eBay Like a Pro



"Titanium eBay" is a new book written by eBay PowerSeller (since 1999), Skip McGrath, to help transform sellers into eBay entrepreneurs. McGrath is author of seven books on eBay and web marketing. In Titanium eBay, he shares his knowledge, strategy and secrets to help occasional eBay sellers become Titanium PowerSellers. Titanium is the most successful of five categories of eBay PowerSellers — averaging gross sales of $150,000 a month and a feedback rating of 98 percent positive or better.

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LETTER TO THE EDITOR

Condition-Based-Maintenance Tips

In reviewing your April 2006 Editorial on page 11 and the Prevention Illustrated article from January 2006, I found that I concur with nearly everything written. However, there were a couple of important points left out of each article that your readers should know concerning oil sampling.

The first is that somewhat similar to blood samples, one has to have a base line set of figures to start with. Over many years, blood-sample people have come up with a basic set of parameters for nearly all human blood.

Oil samples from machinery are much the same. Engine samples contain one set of numbers, hydraulic or drive-train samples another. Someone with considerable experience analyzing oil samples can nearly always tell just what compartment a sample originated in, and whether it's a good sample or a bad one.

However, you can increase the accuracy of your oil analysis by taking a "first" sample when your machine is nearly new. Taking early "base-line" samples allows you and your lab to compare results from later on to the early one, and see exactly how each compartment is progressing. I recommend doing this to used machines as well.

Additional benefits from this practice include sometimes finding problems that are occurring as a result of poor assembly at the factory or very early damage from other causes that may be still covered under your new-machine warranty. During my career, I detected several examples of this that saved my company thousands of dollars in repair bills and down time or lost production.

The main benefit is, of course, that having those early numbers will allow you to quickly determine a compartment that is going bad. Once those numbers reach a certain point, it's time to decide what to do, and that decision is often dictated by what's contained in the sample.

I found nearly nobody in the heavy earthmoving or mining industries that ever sampled their bulk oils or oils in tanks aboard a lube truck. This is a big mistake, for those containers can contaminate a whole bunch of machines in just one shift if the bulk lubricants are damaged from water or dirt seeping in through a damaged gasket or seal.

Years ago, some lube-truck manufacturers fabricated bulk containers for mounting on a truck out of just one large tank with the individual compartments separated by a thin bulkhead. Trouble was, over time, those bulkheads flexed enough to crack and start leaking their contents into the next tank over. I've had to deal with new engine oil that was contaminated with coolant or waste oil, gear oil that was damaged by hydraulic oil seepage, and drive-train oil that was ruined by all three. It took a while to figure out just where the contamination was occurring, and it cost us big time.

For large machines and small, if you want to save maintenance and repair money in the long run, there is no substitute for oil-sample analysis. And one important key is, start early.

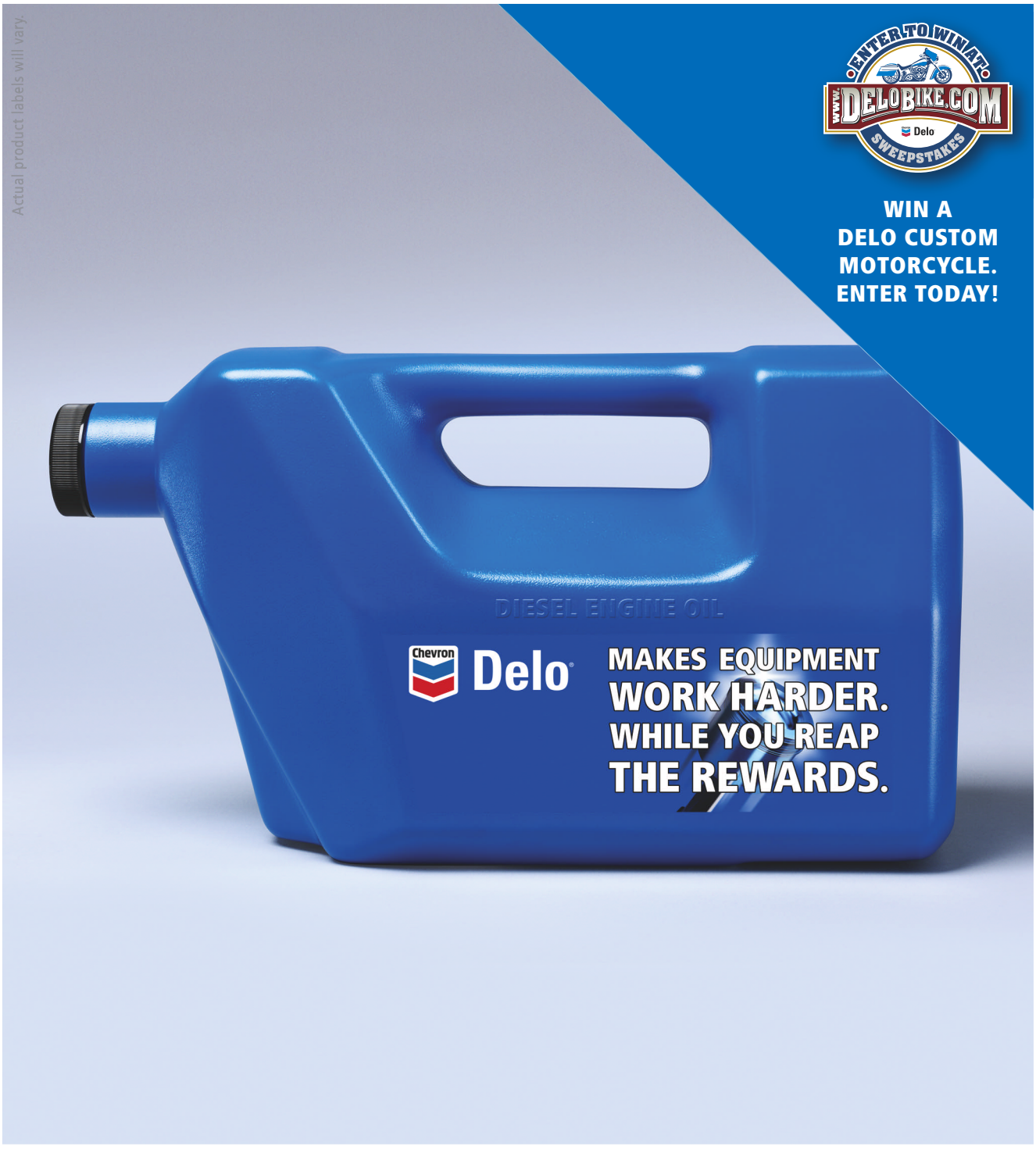
— *Joe Doremire*

CORRECTION

Missed a Decimal

In "Great Managers" [June, page 70], we inaccurately cited Red Mountain's machine availability calculations. Last year's fall down rate was actually 0.3 percent. We regret the error.

— *The Editors*



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CONSTRUCTIONEQUIPMENT.COM NEWS

Online Equipment Specs Are Updated Monthly

Manufacturers update machine specifications on a regular basis. To stay current, equipment managers can turn to ConstructionEquipment.com for the most accurate and up-to-date specifications, powered by Spec Check.

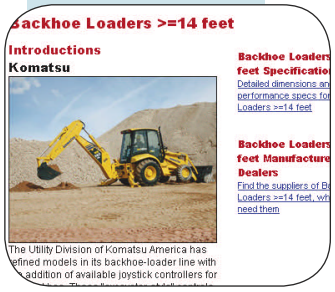
Each month, Spec Check adds, on average, 100 new models and processes revised specs for 100 more.

Add to that the discontinued models that can be accessed when researching used equipment, and managers can find more than 11,300 models in the Spec Check database.



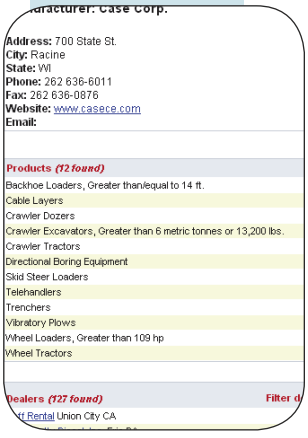
How to Use ConstructionEquipment.com

Choose from the list of categories and subcategories to find all information the site has to offer on a specific type of equipment.

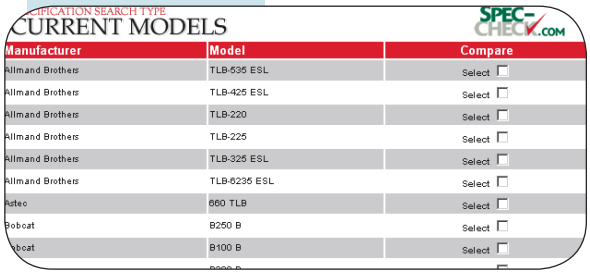




From Find Dealers & Manufacturers in the horizontal navigation bar, drill down to manufacturer contact information, the products made by the company, and dealers as available.



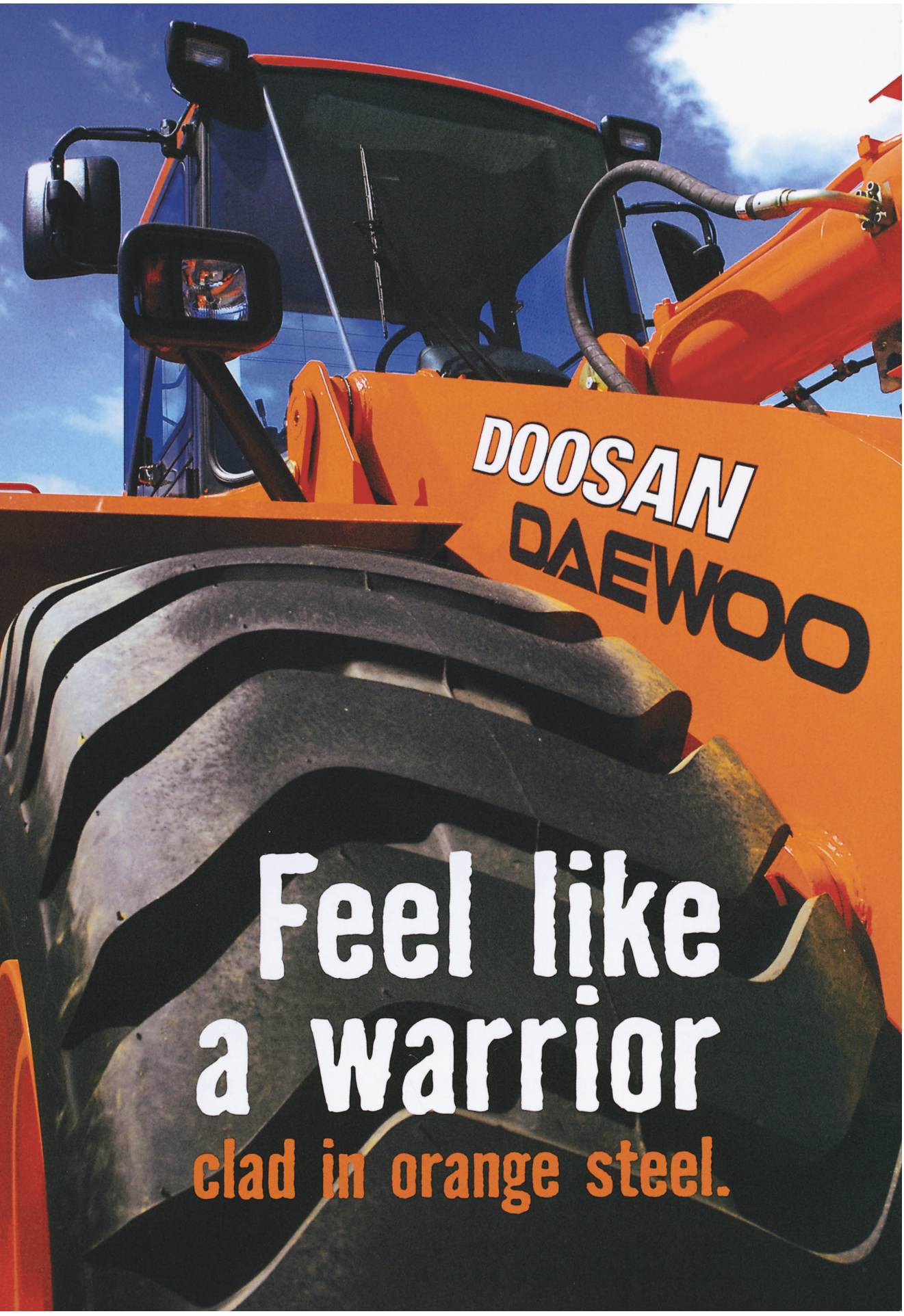
From Specifications in the horizontal navigation bar, compare specs on 63 types of construction and forestry equipment at no charge.



Find the latest in equipment introductions, as well as news and links to recent machine-evaluation and new-product articles at ConstructionEquipment.com's home page.

Read information on maintaining and managing fleets, as well as magazine archives, in the horizontal-navigation bar.

Scan headlines from news around the country. Click on the headline and read more pertaining to construction, equipment and related topics.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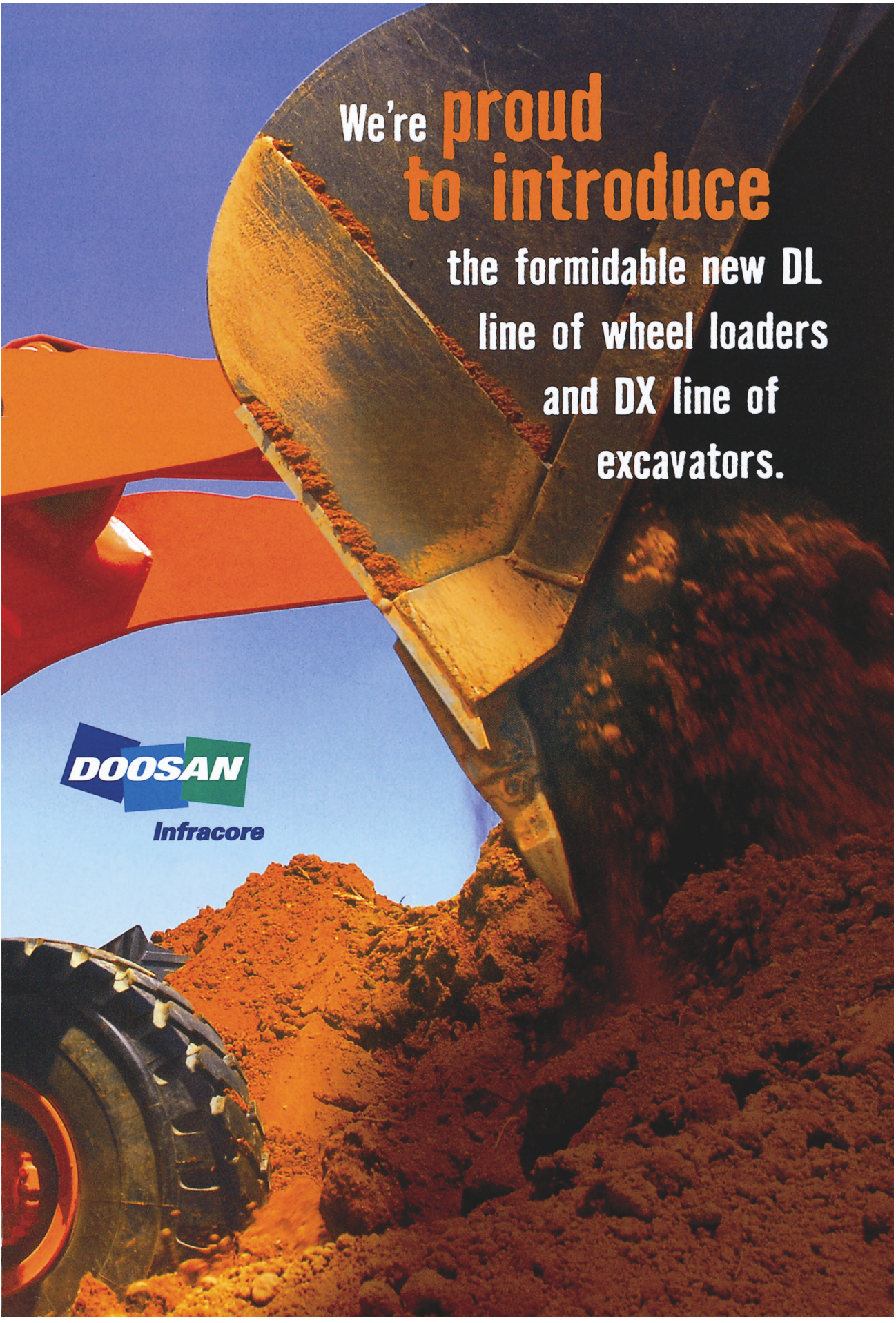
  - Reinforced buckets have a longer lifespan
  - Longer-lasting, heavy-duty brakes
- **Efficiency—increased fuel economy**
- **Extended service intervals**
- **Tier III engines**

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Comfortable for Operators

- **Luxurious cab**
  - As roomy as this machine is powerful
  - Frameless front window and new rear design increase visibility and safety
  - Adjustable seat and controls provide ease and comfort
- **Low noise level**
  - Lower cooling fan speed, double-walled muffler, tightly sealed cabin plus a soundproofed engine and cooler compartment create a quiet work environment
- **Automatic climate control**
- **Smooth ride, even on harsh terrain**

Easy for Technicians

- **An easy-to-work-on machine**
  - Clean design provides easy access making maintenance a dream
- **Electronics help identify and correct problems quickly and easily**
  - Laptop diagnostic program to easily diagnose transmission
  - E-Doctor gives you vital engine information right on your laptop

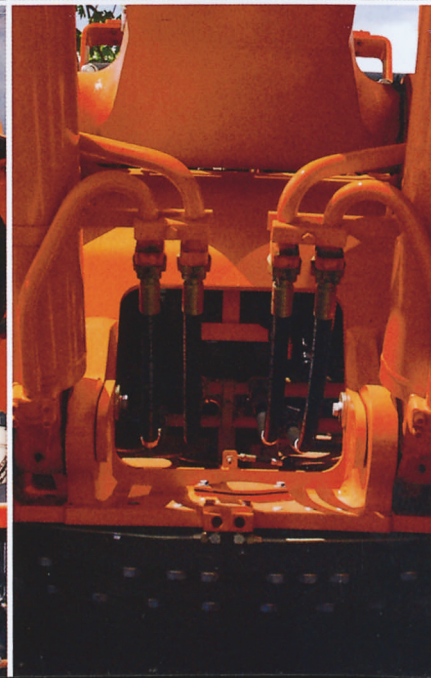


The Doosan DX excavator and DL wheel loader are the next generation of the hardest-working, most-reliable heavy-construction equipment on the planet. These beasts are built with monster Tier III engines, extra room in the cabins and a clean design that's a technicians dream. They're also durable—like all Doosans, they regularly clock much longer hours than the industry average. And they come with our strong commitment to complete lifecycle care. That's why Doosan is the fourth largest manufacturer in the world.









Doosan DX Excavators

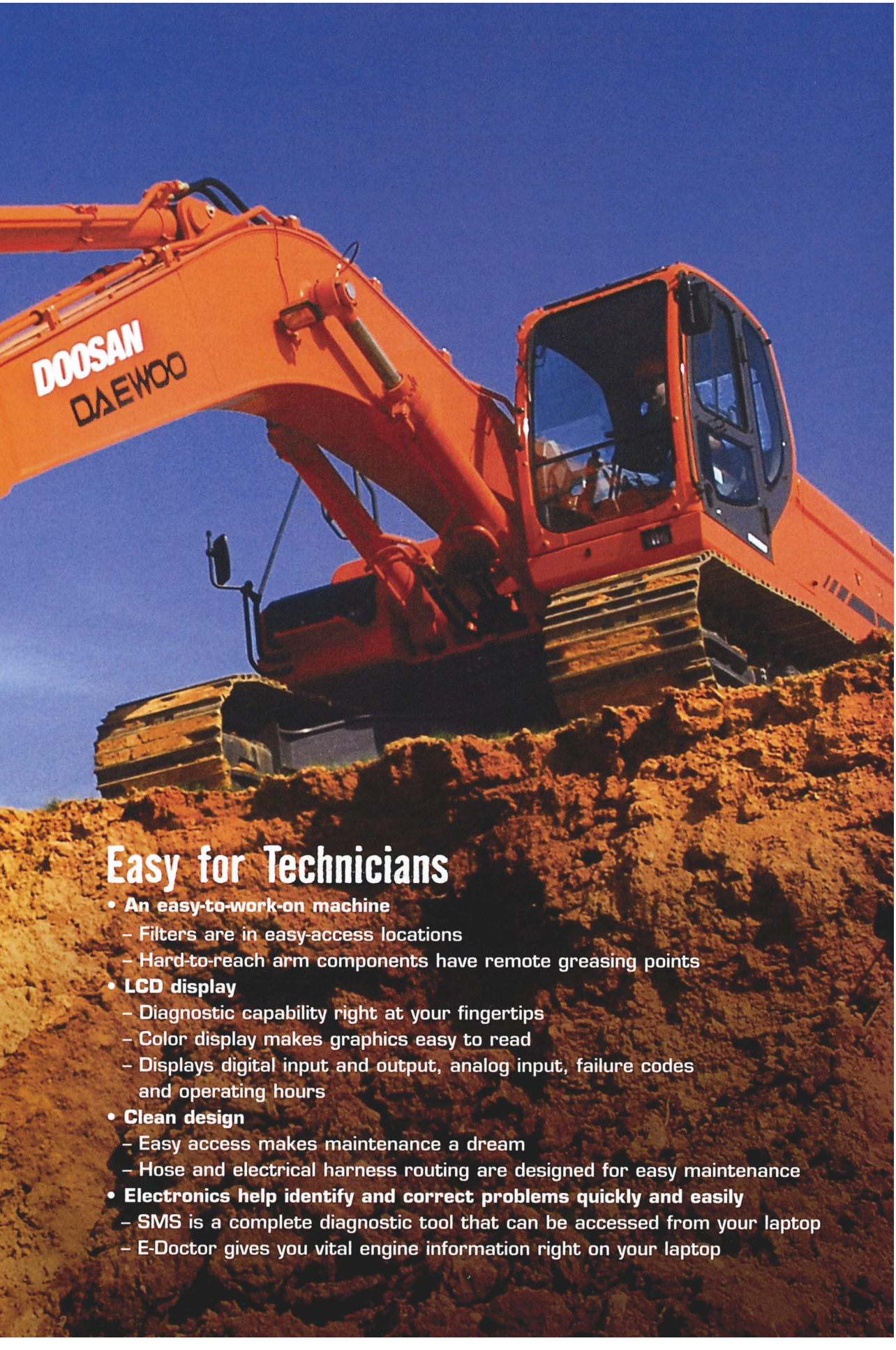
Smart for Owners

- **Unparalleled durability**
  - Aluminum hydraulic oil cooler increases cooling capacity and resists pressure spikes
  - Fuel cooler increases the life of engine's electrical components and fuel efficiency
  - Fine meshed bushing and increased greasing intervals mean lower maintenance cost
  - Polymer shims and hardened-metal wear disks add durability
- **Easy maintenance thanks to new electronics package (SMS and E-Doctor)**
- **Extended service intervals**
- **Tier III engines**

Comfortable for Operators

- **Luxurious cab**
  - Massive size with plenty of elbowroom
  - 360 degree visibility for a safer jobsite
  - Six-way adjustable seat and telescopic control stand accommodate any operator
  - Fully automatic climate control
- **Low noise level**
  - Silence wall between engine and pump and lower RPMs on cooling fan keep work environment quiet





Easy for Technicians

- **An easy-to-work-on machine**
  - Filters are in easy-access locations
  - Hard-to-reach arm components have remote greasing points
- **LCD display**
  - Diagnostic capability right at your fingertips
  - Color display makes graphics easy to read
  - Displays digital input and output, analog input, failure codes and operating hours
- **Clean design**
  - Easy access makes maintenance a dream
  - Hose and electrical harness routing are designed for easy maintenance
- **Electronics help identify and correct problems quickly and easily**
  - SMS is a complete diagnostic tool that can be accessed from your laptop
  - E-Doctor gives you vital engine information right on your laptop



Brief Specs—DX

	DX300	DX340	DX420	DX480
Operating Weight (lbs.)	66,579	76,721	92,370	106,900
Maximum Digging Depth (ft./in.)	24'1"	24'7"	25'4"	25'7"
Net Engine HP (SAE1349)	197	247	293	328
Net Torque	673	846	1013	1137
Bucket Digging Force (lbs.)	44,974	47,840	59,524	67,900
Arm Force (lbs.f)	30,423	38,140	43,430	49,800
Swing Torque	74,956	84,337	84,836	93,306

Brief Specs—DL

	DL300	DL400
Operating Weight (lbs.)	38,140	49,604
Net Engine HP (SAE1349)	217	280
Tipping Load, Full Turn (lbs.)	26,676	36,376
Bucket Capacities (cu. yds.)	3.9	5.1
Break Force (lbs.)	36,419	49,458
Tipping load straight (lbs.)	31,967	41,667

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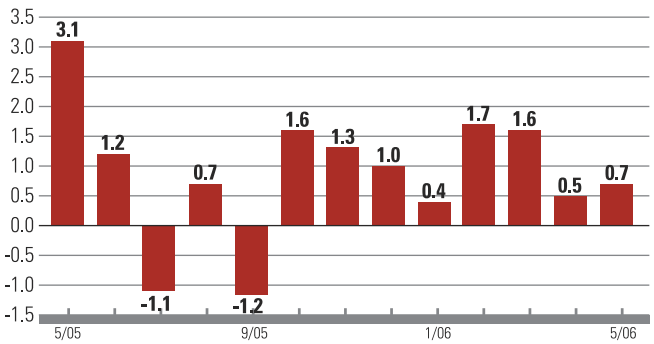
By JIM HAUGHEY, Director of Economics

↑ PUBLIC CONSTRUCTION SPENDING

Spending expanded at a 12-percent pace in the first half of 2006; private construction spending fell in April and May, and homebuilding declined. This difference will not persist. Most of the gain was inflation, especially cement and asphalt. As a result, many projects are over budget. Delays and postponements are increasing. The value of heavy-construction starts reported by Reed Construction Data declined 0.8 percent year to date through May after a 35-percent surge in 2005.

(% change from previous month)

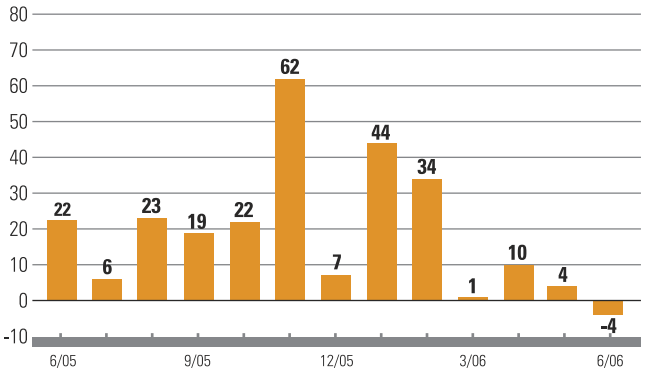


Source: U.S. Department of Commerce

↓ CONSTRUCTION EMPLOYMENT

Construction employment has been steady for four months. Hiring for nonresidential building projects has been offset by layoffs in homebuilding and heavy construction. Several more months of little, if any, net job additions are likely until homebuilders work off their surplus of unsold homes and heavy project budgets are updated to cover recent surges in cement/asphalt prices. Then 160,000 more jobs are expected by the end of 2007, although this is half of the hiring pace of 2004-05.

(Change in jobs, thousands)

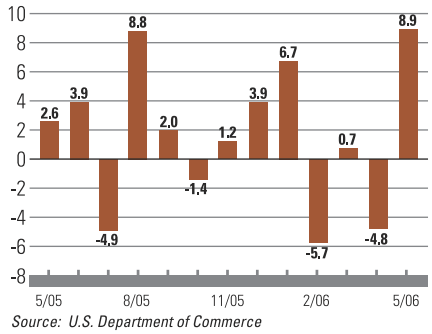


Source: U.S. Department of Labor

↑ CONSTRUCTION EQUIPMENT SHIPMENTS

Construction equipment shipments from U.S. factories were a record $3.1 billion in May. Orders were $3.4 billion, so shipments are expected to average near the May level for several more months and then slip under $3.0 billion a month through the end of next year. This outlook assumes that equipment prices will rise faster than overall inflation well into next year. Extended delivery lead times will remain although they will begin to shorten later this year.

(% change from previous month)

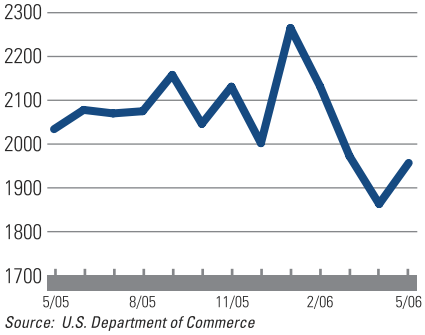


Source: U.S. Department of Commerce

↑ HOUSING STARTS

Housing starts increased in May, but the starts outlook is for a decline from 2.2 million early in 2006 to less than 1.9 million by next spring. Mortgage rates approaching 7 percent are trimming demand at the bottom of the market. The 50-percent slowdown in home price appreciation is trimming demand at the top of the market. There is little risk of a deeper housing slowdown because jobs and income will continue to expand, although more slowly than in the past three years.

(Annual rate, thousands)

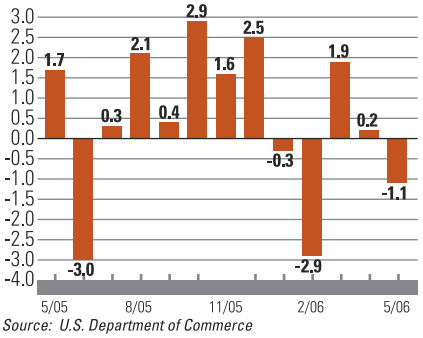


Source: U.S. Department of Commerce

↓ COMMERCIAL CONSTRUCTION SPENDING

Spending declined, after inflation, in the first half of 2006 after a large surge late in 2005. Spending is expected to outpace inflation by 2 to 3 percent through the end of 2007 following the 20-percent increase in the value of retail construction starts year to date through May measured by Reed Construction Data. Shopping center starts are strong, but stand-alone store starts remain weak. Early summer declines in retail employment signal that chain retailers are turning cautious.

(% change from previous month)



Source: U.S. Department of Commerce

For the full text of this month's economic analysis, check Economic Outlook at **ConstructionEquipment.com**



Mom always wanted me to be a banker.

Fact is, no banker has anything on me. Let's say I showed you the equipment you want and now you need financing. You can go to a banker, or you can stay with me. I understand better than him why you need what you need, including a flexible payment plan. Odds are I'll help you get lower rates than he will. And I'll be with you all the way to make sure the process is fast and painless. Ok, so bankers do get to work in pretty offices and wear pretty suits. But I tell you, those wimpy hours would drive me crazy.

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CONSTRUCTION EQUIPMENT EXCLUSIVE FIELD TEST

D155AX-6 CRAWLER DOZER

Powerful New Dozer



Dash-6 Production Advantage
25%

Dash-6 Fuel-Efficiency Advantage
13%

TEST SET

- Type . . . . . Crawler Dozer
- New Model D155AX-6
- Operating Weight . . . . . 87,100 lb.
- Net Horsepower 354/320*
- Replaces Model D155AX-5B
- List Price (estimated, as tested) $595,000

* Cooling-fan speed minimum/maximum

TEST FIELD TEST FIELD TEST FIELD TEST FIELD TEST

Has Good On-Site Numbers

In a recent *CE* field test, Komatsu's new D155AX-6 crawler dozer went blade-to-blade with its D155AX-5B predecessor — and proved what technology can accomplish

By WALT MOORE, Senior Editor

As we watched Komatsu's brand-new D155AX-6 crawler dozer at work on top of a Georgia mountain, our lasting impression of the machine is the way it sliced cleanly through limestone deposits in its path. Perhaps the new dozer's performance would have been less notable had we not just moments before observed its predecessor model work up a considerable sweat getting though the same spot. We witnessed this rather striking comparison in blade performance while working with Komatsu in late May to evaluate the capabilities and features of the new D155AX-6 ("Dash-6"), compared with those of the machine it replaces, the D155AX-5B ("Dash-5B").

The Dash-6 was introduced just a few months ago, and it's a significantly different tractor than the Dash-5B. Although the primary reason for developing the new model was to comply with Tier-3 emissions regulations, Komatsu took a hard look at the overall design of the Dash-5B and opted to make extensive additional changes in the Dash-6, including an innovative new blade, refined transmission and lock-up torque converter, an undercarriage borrowed from mining-tractor counterparts, plus, a redesigned cab with enhanced electronic controls and instrumentation.

We put one of these newly designed Dash-6 units to work — along side a virtually new Dash-5B — at Komatsu's 500-acre training and testing facility in Cartersville, Ga., where the company is developing a new demonstration

Fitted with an external ROPS, the D155AX-5B (below), introduced in late 2003, weighed in at 86,400 pounds equipped with a semi-U blade and ripper. Its Komatsu SA6D140E-3 Tier-2 diesel engine was rated at 310 horsepower when the cooling fan was operating at maximum speed.



Weighing in at 87,100 pounds with a Sigmadozer blade and a ripper, the new D155AX-6 (left) delivers 320 net horsepower from its Tier-3 Komatsu SAA6D140-5 diesel engine when its hydraulic fan is operating at full speed. The dozer features a refined transmission with auto-shift capability, new lock-up torque converter, roomier cab with an expanded-capability monitor, and the company's Komtrax wireless information system.

Photos: George Pfoertner©





The D155AX-6 test machine at Cartersville was fitted with the new Sigmadozer blade, which has a V-shaped vertical pocket at each end. The new blade, says Komatsu, reduces cutting resistance, rolls material more effectively, and redirects material flow toward its center, resulting not only in larger loads, but also in considerably less windrowing off the sides.

area. When the new area is completed this fall, Komatsu's site-development contractor, C.A. Murren & Sons, will have moved a million-plus cubic yards of material, most of it a tough mix of red Georgia clay and rock.

In fact, Murren's on-site supervisor, Greg Smith, was kind enough to loan us one of his best dozer operators, Marcos Ballesteros Guillen, for the Dash-6/Dash-5B evaluation. Guillen regularly runs Murren's 525-hp Komatsu D-375A-5 at the site. Our second operator was Komatsu's Gary Svoboda, operator instructor/developer at the Cartersville facility.

Essentially, our in-the-dirt comparison entailed having both Guillen and Svoboda use each machine to open a reasonably large slot trench. Comparing the Dash-6's production in this exercise with that of the Dash-5B gave us a glimpse into the relative work capabilities of these two dozers. We also monitored fuel consumption during the comparison as means for assessing relative fuel-efficiency between the two.

Komatsu's Kim Karry, product marketing manager, crawler dozers, was instrumental in arranging the evaluation. Our host at the Cartersville facility was senior product manager (demo site and product training), Ed Warner, who, among other responsibilities, is overseeing the demonstration area's development.

In the dirt... and the dust

Weather for the two-day evaluation had even the natives complaining — with temperatures in the mid-90s and humidity to match. But the days were bright and clear, and we considered the heat and humidity probably a good trade for no rain.

Both test tractors were fitted with a similar variable single-shank, "giant" ripper, but blades differed significantly. The Dash-5B used a semi-U type — 13 feet wide, 5.7 feet high and with a rated capacity of 11.5 cubic yards. The Dash-6, however, was equipped with the newly designed Sigmadozer blade, which Komatsu has developed for its mid-range and large dozers.

The Sigmadozer blade has a cutting edge with a center section that parallels the plane of the blade, but then angles sharply rearward near each end of the blade to intersect with end-wing sections, which again bring the cutting edge forward at an angle. This new 12.3-cubic-yard-capacity blade is 13.25 feet wide, 6.1 feet high and incorporates hydraulically actuated pitch and tilt control.

We staked out four 50-foot-long trench sites and asked Guillen to work one of the machines until the pre-determined trench length was excavated to an approximate depth of 4 feet, with the width being that of the blade. We timed this process until, in his judgment, the trench was of the proper dimensions. Then switching to the other dozer, Guillen duplicated the first trench as closely as possible. We stopped the watch when he indicated that the second trench matched the first. Svoboda then repeated this two-trench process.

We then measured each operator's two trenches in order to calculate the volume excavated. With this figure and the time for excavation, we calculated an hourly production rate for each trench. By averaging the rate for the two Dash-6 trenches, and comparing the result with the averaged production in the Dash-5B trenches, we determined that (in this particular exercise) the Dash-6 exhibited a production advantage of slightly more than 25 percent.



Think of productivity and the 5700-B Super comes right to mind

"Our customers are amazed at the speed of the 5700-Super-B. We put down more concrete quicker, and the machine doesn't slow down on higher grades. There's more power in the trimmer.

"The biggest difference is the speed. The operator is always asking for four or five trucks. That's telling me that production is going way up.

"The machine runs cooler and is easier on ther operator and doesn't wear him down by the end of the day."



Sam Craghead, Craghead Building Co., Riverton, UT





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The new tractor also used 13-plus percent less fuel in this exercise. Because each operator excavated basically the same volume of material from each of his two trenches, we concluded that the two dozers did essentially the same amount of work, even though the Dash-5B took longer to do so. Thus, it's fair to say that the Dash-6 exhibited a 13-percent fuel-efficiency advantage, that is, it did as much work as the Dash-5B with 13 percent less fuel.

Accounting for differences

Thinking through the numbers that resulted from the comparison of these two Komatsu dozers, our first observation is that the new Sigmadozer blade likely was responsible, to a significant degree, for not only the advantage in productivity, but also for the advantage in fuel-efficiency.

The design of the new blade, says Komatsu, reduces cutting resistance and rolls material more effectively. But in concert with these characteristics, according to the company, the new blade also redirects material flow toward its center, resulting not only in larger loads, but also in considerably less windrowing off the sides. The Dash-6 also uses larger push arms, which permit using just one strut (on the right side) with the Sigmadozer blade, a design that brings the blade closer to the tractor nose for enhanced digging forces.

We would guess that the new blade's lowered cutting resistance and enhanced digging forces are notable contributors to the fuel-efficiency advantage noted for the Dash-6. But the Dash-6's new engine, certainly, is also a prime contributor to its observed fuel efficiency.

The new Komatsu "ecot" (ecology and economy technology) SAA6D140E-5 engine, with 10 more net horsepower than the Tier-2 version of the engine in the Dash-5B (320 versus 310), is equipped with cooled-EGR, common-rail fuel injection, charge-air cooling and new electronic controls. (The net-horsepower difference is predicated on the machines' hydraulic fans running at full speed.) Difficult to quantify, however, is the contribution to better fuel-efficiency made by the Dash-6's new Tier-3 engine and that made by its Sigmadozer blade, which is not available for the Dash-5B.

Of course, even if running both tractors with the Sigmadozer blade had been possible, we'd still be left wondering how much the Dash-6's new transmission and lock-up torque converter contributed to the new model's overall better fuel-efficiency. The new transmission provides both a manual

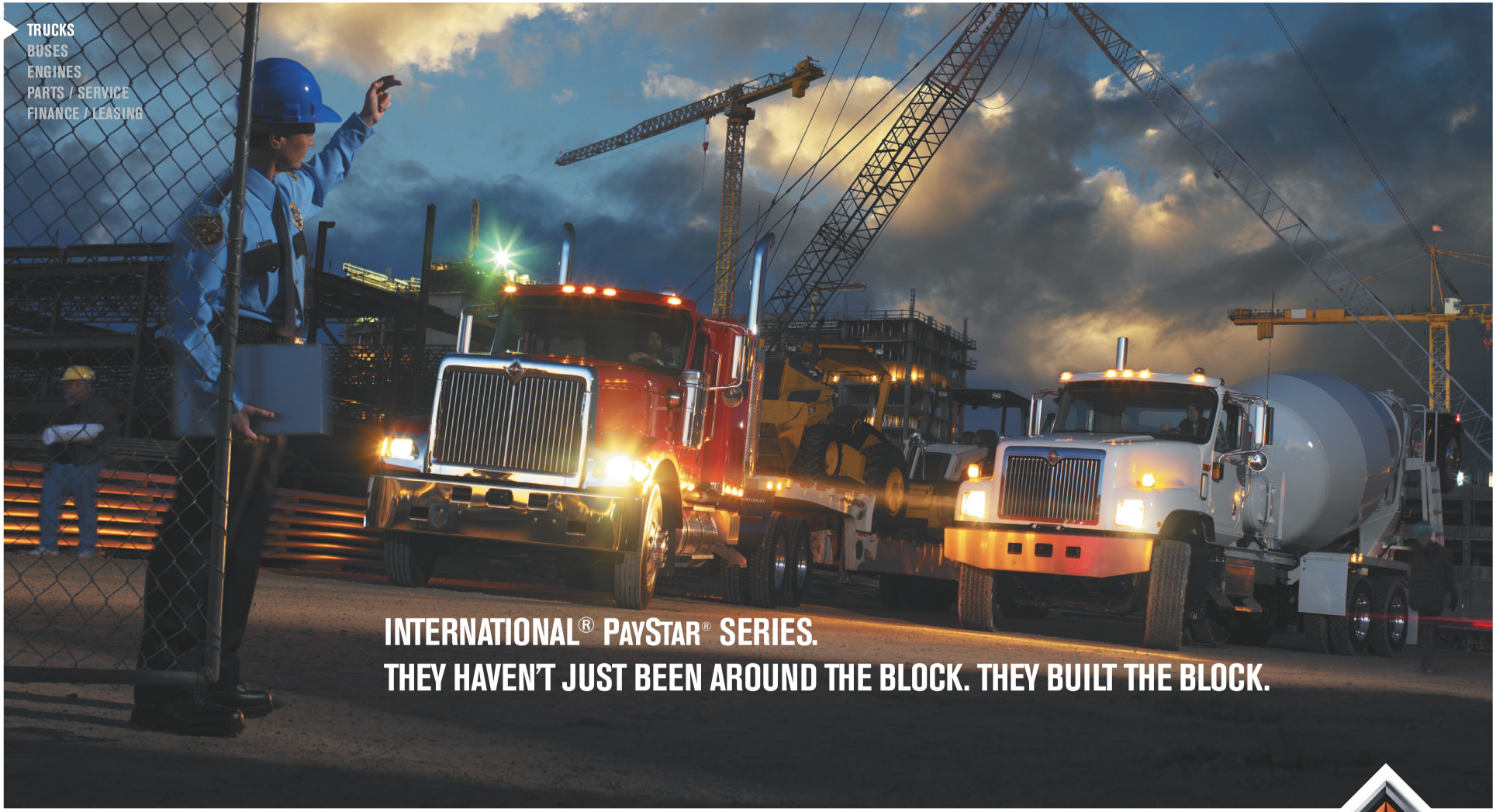
Checking Fuel Consumption

Although the use of auxiliary tanks is the best way to monitor fuel consumption, the top-off method is effective if carefully done. When the first machine was in position for pre-test fueling (left), we created positioning benchmarks, at the rear of the tracks, which allowed us to subsequently locate each machine in exactly the same spot. We also placed a 5-foot level on the left rear fender and across the back of the tanks (just below the rear window) to establish benchmarks, respectively, for the fore-and-aft and side-to-side attitudes. Initially, the tanks were filled until fuel just covered the bottom of the debris screen. When refueling to check consumption, we weighed replacement fuel in a manageable container across an electronic scale (center), then again filled the tanks to the bottom of the screen (right).









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and an automatic mode. In the automatic mode, it makes shifts based on electronic information received by communicating with controllers for the engine and for the steering and hydraulic systems. The net result, says Komatsu, is that gear changes are timed to keep the power train operating continuously at maximum efficiency.

In addition, the new lock-up feature in the torque converter is activated when the transmission is in either its automatic or manual mode. Automatic lockup occurs in the normal dozing speed range and, according to Komatsu, this feature eliminates the horsepower loss and the generated heat of the conventional "open" torque converter.



The D155AX-6 has an overall more robust undercarriage than its predecessor, with a wider gauge and more track-on-ground. The Dash-6 undercarriage also uses Komatsu's "K-type" bogies, which incorporate a pair of bottom rollers housed in an oscillating frame that is suspended only at one end.

Refinement bottom and top

Backing up the higher forces at the Dash-6's cutting edge is a more robust undercarriage. The track frames are thicker and incorporate an added bottom roller (seven, versus six for the Dash-5B). Overall, the undercarriage gauge is wider (by an inch) and places 3 inches more track-on-ground than does the Dash-5B.

Perhaps the most significant undercarriage change is switching the "X-type" bottom-roller bogies in the Dash-5B to "K-type" bogies in the Dash-6. The bogies for both machines are a two-roller assembly mounted in an oscillating frame. The heavier K-type is suspended at one end, compared with the center-mount suspension of the X-type and, thus, says Komatsu, does a better job of following the track link on uneven terrain to maintain alignment. The payoff, according to Komatsu, is longer undercarriage life and a smoother ride for the operator.

At the top of the machine, a roomier new cab (6 inches longer, 2 inches wider and an inch taller) makes for a more comfortable place to work, and replacing the external ROPS on the Dash-5B with an integrated structure in the Dash-6 cab makes for all around better visibility.

Also new in the cab is a large, 7-inch, color LCD monitor, which not only displays operating information, but also provides a start-up inspection screen, tracks maintenance intervals and communicates error codes in a four-step process. Most diagnostic work, says Karry, can now be accomplished directly through the monitor. New for the Dash-6, too, is elimination of pilot hydraulics under the blade-control joystick. This function has been given over to electronic control, as are the transmission, ripper, steering system and throttle.

The new dozer also incorporates, as a standard feature, Komatsu's latest Komtrax system, which sends the machine's location and operating information wirelessly to a secure website. According to Komatsu, the system has the potential to increase machine availability, reduces the risk of theft, and allows remote problem diagnosis by the distributor.

So, in summary, based on our comparison of the D155AX-6 with the D155AX-5B, we'd say the new model not only has the potential to be considerably more productive and fuel-efficient than its predecessor, but also, in many ways, has the potential to be much smarter.



Both the Dash-6 and the Dash-5B feature Komatsu's single-lever, Palm Command Control System for steering and blade control. The Dash-6 also uses a new variable-displacement, axial-piston pump in its implement hydraulic system, which operates at a considerably higher pressure than the gear pump in the Dash-5B.

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By DAN SULLIVAN, Mechanic, Teacher/Author and Electrical Troubleshooter



Rule 4: Use every clue.
Always take advantage of every clue the manufacturer gives you — keys, legends, indexes, charts, notes, patterns, serial numbers and so on.

The Electrical Schematic Is Your Friend

Or…how to read truck and machine electrical schematics competently, even though others may accuse you of wasting time

RULES

Rule 1: Read first to learn how the circuit works, then redraw to troubleshoot.

Rule 2: When tracing a circuit, always work from the load to the battery, or from negative to positive.

Rule 3: There is usually only one load component per circuit, because 99.9 percent of all circuits are parallel.

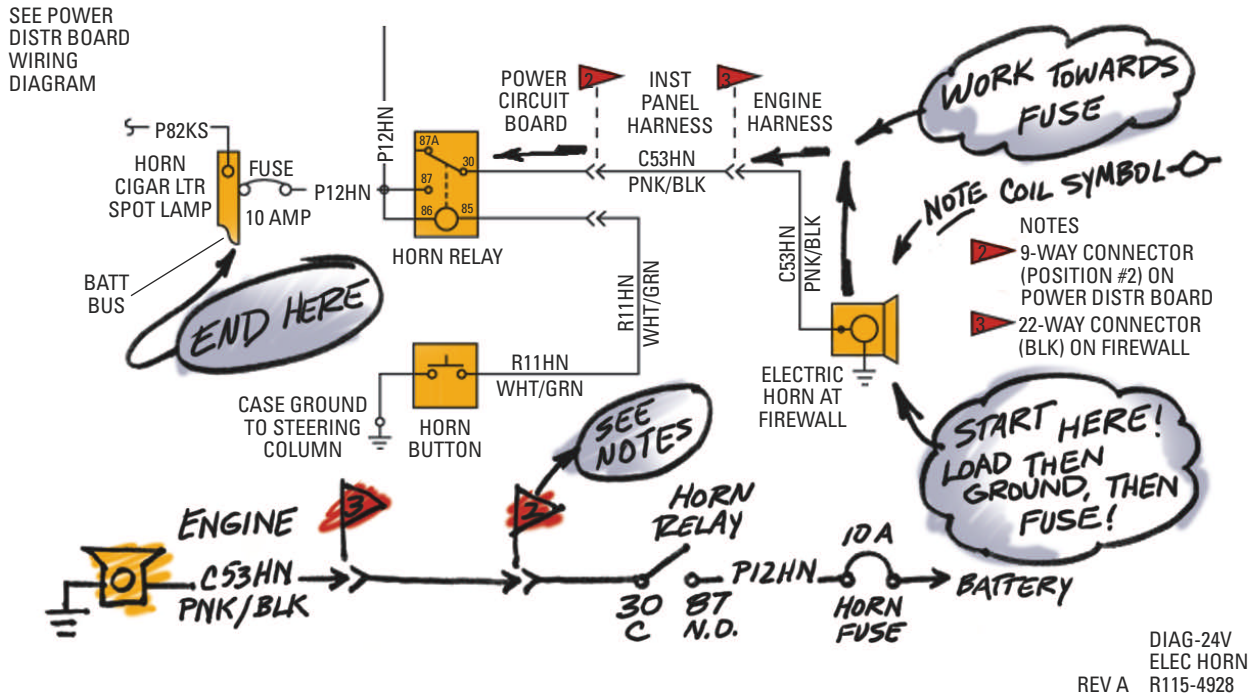
Rule 4: Use every clue the manufacturer gives you.

If there's one thing mechanics hate more than math, it's reading electrical schematics. Here's why. First you have to find it, which is not always easy. Once found, you have to figure it out — also not easy if you go at it the wrong way. And, most disconcerting, you have to put up with feelings of insecurity and self-consciousness as you study the schematic, worrying that someone (including your boss) might think you're weak, or incompetent, or stupid or just wasting time by doing something other than real work.

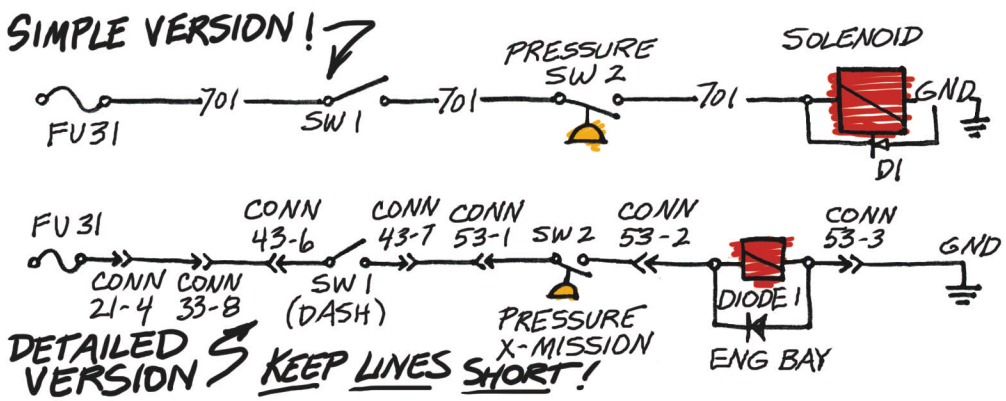
So, okay, if you're capable of memorizing hundreds of pages of data about thousands of circuits on scores of machines, then go for it! But if not, get the book, get the schematic, and get to work. And if you do, a year or so from now your friends in the shop will be calling you the "electrical wizard." CE

Construction Equipment thanks Dan Sullivan for sharing excerpts from his book, Fundamental Electrical Troubleshooting. Sullivan is a full-time trainer, helping technicians understand and apply electrical theory and problem diagnosis. He also is the inventor of the TESlite, a diagnostic instrument for troubleshooting electrical problems. Text and drawings are used with permission. You can reach Sullivan at Sullivan Training Systems, 877-WRENCH2, or at www.brighterideas.com.

Rule 1: Read to learn, then redraw to troubleshoot.

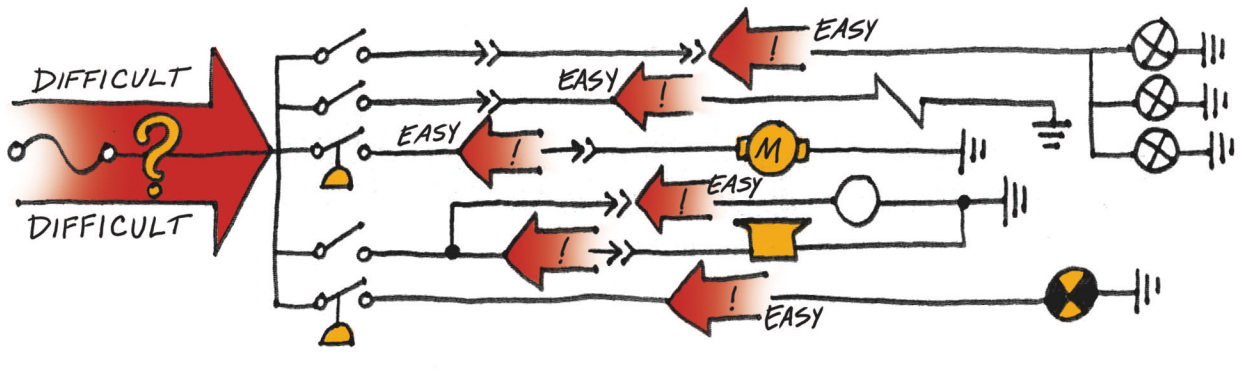


Some schematics are drawn as a straight line, called "ladder diagrams." If not, you should take the time to read the schematic and learn how the circuit works. Then, redraw the whole circuit as a straight line. Reading the schematic and then redrawing is a very critical rule.



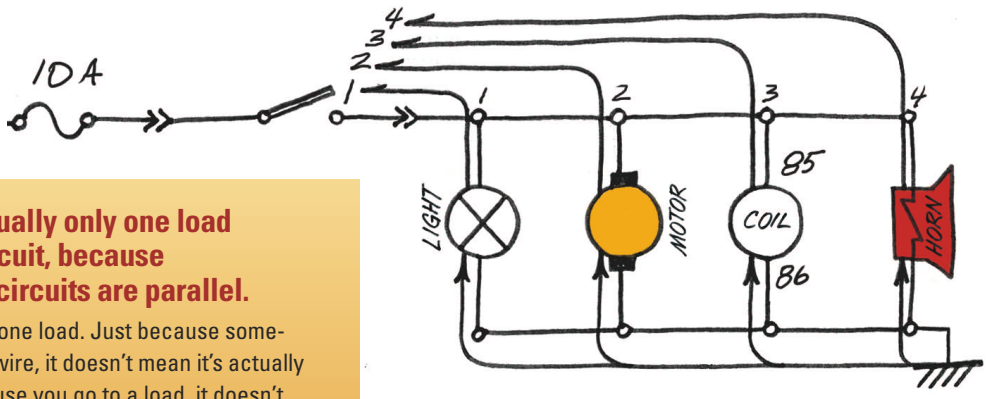
Here are some added points:

- If you try to draw at the same time you're reading (because you want to save time), all of the errors you might make — will make — while reading will be in your sketch.
- Even if you don't draw a perfect picture, the effort will familiarize you with the circuit.
- You can make notes on the drawing as you work.
- The more you do this, the less you'll need to do it.
- Your first effort to draw the circuit should be a simple version — positive, ground, switches and load.
- I've learned that many people struggle with the detailed drawing, so if you make a simple sketch first, you'll at least know what the circuit does, then you can go back and add the details.



Rule 2: When tracing a circuit, always work from the load to the battery.

Find the load component first (for instance, light, horn, coil, solenoid or backup alarm), then find its ground, and then find the battery. Trying to read a schematic from positive to negative doesn't work. Always work back toward the battery from the load. This rule is important because it gives you a correct direction. All grounds must eventually end at the battery (not inputs).



Rule 3: There is usually only one load component per circuit, because 99.9 percent of all circuits are parallel.

Most circuits have only one load. Just because something is connected to a wire, it doesn't mean it's actually in the circuit. Just because you go to a load, it doesn't mean you must go through it. This rule is critical because it helps you know where to go — and where not to go. Remember, you have to think about how a system works. Current doesn't flow around in circles through each load, it flows from ground to battery. As you trace a circuit, if you hit another load, you're wrong. Turn around! Remember Rule 2: Always start at the ground and work to the battery. Note that in the accompanying diagram, there are four circuits in the system.



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By G. C. SKIPPER, Contributing Editor

Managers Are Trained, Not Born



No longer is it enough to focus just on the mechanical aspect of fleet operations. Fleet managers now have to be versed in asset-management skills and computer technology

In a simpler time, the career path from shop floor technician to construction-equipment manager was well defined. Going from wrench-turner to the manager's swivel chair carried familiar responsibilities, namely, to keep the equipment operating and to keep downtime to a minimum, plus making sure preventive maintenance was done on a timely schedule.

But roughly 10 to 15 years ago, two things dramatically and permanently changed that route to success. First, the available pool of qualified shop technicians from which many equipment managers were drawn began to dry up. Today, it's down to a trickle. Second, at the opposite end of that evaporating pool, advancements in both equipment and managerial technology washed over the industry like the aftermath of a storm.

The impact of both developments caused a shift in the nature of the equipment manager's job. No longer was it enough to focus on the mechanical aspect of fleet operations. More fleet managers had to be versed in asset-management skills such as finances and long-range planning, having the ability to look ahead for several years to determine equipment lifecycles and equipment-replacement schedules. They also had to comprehend the use of computer technology for diagnostic purposes and even in negotiations to make sure they purchased the right equipment at the right price.

Today, it has become increasingly obvious that professional equipment managers are not born. They must be trained.

Yet Mike Vorster, professor of construction engineering at Virginia Tech and author of *Construction Equipment*'s "Equipment Executive" column, doesn't describe the movement as a general shift. "It depends on the company and how the company is structured," he says. "It depends on whether the company sees the fleet as a corporate asset or just as a tool to get the job done."

If a company views its lead person in the equipment-management group as someone who looks after the shop and the yard, back-



ground skills and training as a mechanic are necessary and, in many cases, sufficient to fulfill the function, he says.

"On the other hand," Vorster says, "if the company sets up its fleet management so that the equipment manager is a member of the executive team — involved with assets, asset management and return on investment — that shop experience as lead mechanic is important, but there are many, many skills that the equipment manager needs to find some other way."

Vorster teaches his management strategies in the Construction Equipment Institute. For information, go to ConstructionEquipment.com and choose "CE Institute" under the Maintenance & Management dropdown menu.

With the equipment manager as part of the executive team, top management expects the department to be managed as tightly and as efficiently as any other well-run business.

"It's not something you can come in right off the street and do, even if you're a good manager," says Warren Laing, field service manager for the City of Peoria, Ariz. "It's a completely different animal, especially with a government agency. There are steps and procedures you sometimes have to follow to meet city, state or county guidelines. You can't just go off and do something."

Anyone coming into the public sector from the private sector will find that "this is probably the most frustrating piece of the equation — getting through the bureaucracy," he says.

Laing recently applied for a grant to help establish an ethanol fuel program. "We have a new ethanol plant going in about 30 miles down the road, so we have a local source," he says. "We have enough vehicles, especially our police cruisers that use a lot of fuel, to make it a good program to start with."

Had he been in the private sector, he probably would have received approval within

The shortage of technicians has made the traditional career path from shop floor to equipment manager, "a thing of the past," according to Warren Laing, field service manager for the City of Peoria, Ariz.

Photo: Bob Thompson©

a couple of days. But, he says, in order to endorse the request, the City Council had to pass a resolution saying they agreed with it. Despite the fact that fast response was critical because other municipalities were competing for the same grant, it took about two months to move through the bureaucracy and apply for the grant, Laing says.

Laing sees a shortage of equipment managers. "I serve on the board of directors for the Rocky Mountain Fleet Association," he says. "We have about 1,000 fleet-manager members and another 200 to 300 associate members from our vendors. When I look around the table, everyone — as we classify ourselves — is a grey beard. You see very few young people wanting to get into this field."

The same holds true for the private sector, says Dennis Sullivan, corporate equipment manager for Sunland Construction. He says the technician shortage has reached a critical stage, but "I'm not sure there is a shortage of equipment managers.

"There is an abundance of people who call themselves equipment managers, and I don't want to minimize their responsibilities. But equipment managers who can handle finance, maintenance, policy and procedures, buying and selling equipment, and keeping track of multiple shop locations — those managers are few and far between."

Even if an employee "is a good maintenance guy and the owner has faith in him," he won't be able to grow into the equipment manager's position if he doesn't know anything about accounting or finance or multiple shops, he says.

"Somebody has to train him in those areas or he's going to be left behind," Sullivan says. "He doesn't need to know everything about accounting, because somewhere in that company is an accounting department that can keep him on the straight and narrow. But if a new piece of equipment is purchased, he has to know how long to depreciate it. He should have a policy for that. The equipment manager should be involved in the creation of that policy, and he should take it and run with it from then on."

Managers must also handle acquisition strategy. "You have to make decisions on

Keeping What You Grow

Training technicians to further their careers and grow into equipment-manager positions is a noble and necessary goal, but it does come with a price tag.

According to *Construction Equipment*'s Shop Overhead Survey, the average estimated annual training cost per technician, overall, is $8,417. The spectrum ranges from $8,970 for companies with estimated fleet value less than $1 million to $5,650 for companies whose fleets exceed $25 million in value.

Deciding which individual to train and guide along the career path is not an easy one, but what is even harder is determining how to keep that individual from jumping ship once he has been trained.

Obviously, salary and benefit packages play a factor, but they seldom are the primary reason behind an employee's decision to leave. Although there is no laundry list of do's and don'ts to keep employees anchored and happy, there are a few intangibles that play a key role in keeping employee turnover to a minimum.

At the top of the list of many experienced equipment managers are the words "leadership skills."

Thad Pirtle, corporate equipment manager and vice president at Traylor Bros., says, "keeping employees is difficult. I think you have to draw on your leadership skills. That's the largest part of it. You can have a nice place to work and good benefits, but you have to present challenges to the individual and exercise your leadership skills. That's one of the biggest things that retains employees. A lot of people overlook that and don't put as much emphasis on that as they should. You have to let an employee know where the organization is going, what you can offer in

equipment purchases or leases," Sullivan says. "If you decide to work with a leasing company, the manager has to know how they work. A lot of that is accounting."

Vorster says the need for managerial skills among equipment managers has been there all along, but until now it lacked definition and championing. He breaks the management side of managing equipment into four dimensions. One is people management, "where you get into leadership aspects." A second is administrative, "things like keeping the paperwork straight." The third is the finance side: budget control and financial decisions. "I distinguish between these three, particularly leadership and personnel, which is not unique and specific to the equipment business," Vorster says.

The fourth and most important dimension is the statutory dimension. "This includes learning how to comply with EPA regulations, OSHA regulations, and EEOC regulations," Vorster says. "There is a very, very real need for training in how to stay out of trouble with EPA, OSHA and the EEOC."

Dave Venrick, equipment manager for Rinker Materials, says the need has been there for an extremely long time, "but in the past 10 years the asset management part really came into focus due to costs, machine availability, and commodities such as tires."

"It's a tough business, and it's getting tougher due to costs," he says. "Four years ago, we didn't worry about what a gallon of diesel fuel cost. We didn't wake up in the middle of the night in a cold sweat wondering if we would have enough tires. The whole system has turned upside down, and I don't see any light at the end of the tunnel."

Even with those concerns, Venrick says anyone coming into an equipment-manager's slot still needs a mechanical background. "People are coming out of four-year colleges and directly into the equipment-manager position," Venrick says. "I guess that's a good way to build a manager, but if you don't have the basic background of knowing a water pump from a turbo, or a 9/16th wrench from a 3/4-inch wrench, I think those folks are at a real disadvantage until they — for lack of a better term — start making some major mistakes that

challenges and opportunities. That's what keeps people around.

"If you don't provide really hard challenges for people, they will go elsewhere for excitement," he says. "It's like the old saying: Put one more brick in their pack than they can carry. People will rise up to the challenge."

Theresa F. Anderson, corporate equipment manager for Parsons, echoed Pirtle's words. "I believe the way to prevent a good employee from leaving lies in the management skills," she says. "It lies in the atmosphere you create, in the working conditions, in the rewarding and acknowledgement of people when they perform well. If they are treated well in a good environment, there's no need for them to look around. If someone approaches them, they might listen, but they won't leave if the job and the atmosphere they work in are what they want. By acknowledging them when they do a good job, you are protecting their self esteem and you will retain them."

Pirtle says the average tenure for technicians at Traylor Bros. is 15 years.

Anderson says she's had good employee retention. "I really believe it has to do with treating your people right and treating them with respect and acknowledging them when they do a good job. To me that means a lot."

Mike Vorster, professor of construction engineering at Virginia Tech, identifies "the big three" factors important for employee retention:

- "A good place to work brings together things like communication and issues like recognition.
- "A vision for the future brings together training, training and development, and career path.
- "Compensation brings together the monetary aspects of why people stay."

they learn from."

Although the shortage of equipment managers can be traced, in part, to the dwindling number of technicians, that's only part of the problem, says Laing. Today, what has to be overcome is a stigma attached to entering the equipment business.

"Back in the mid-'60s, many schools taught auto shop as a scheduled class, not as an elective," he says. "If you wanted to go that way, you could. There were very good instructors. If you had a friend who was in auto shop, you wanted to keep in touch with him. If you were working on your car over the weekend, it was good to have someone around who really knew what he was doing. If you were in auto shop you were not looked down on."

Laing has done, and continues to do, a lot of recruiting from high schools, he says, but what he sees now "is a stigma attached to that. If a teacher or an administrator feels a kid is not college material, they put him into auto shop. Very few kids go into that on a voluntary basis."

To demonstrate how serious the situation has become, the Rocky Mountain Fleet Association has four $1,000 scholarships to give away to students each year who want to go into the technician field. "We can't get anybody to take them," he says. "We go to every high school in the state and students just aren't interested."

So who's to blame? Sullivan blames parents. "They want their children to be doctors, lawyers and engineers," he says. "But by doing that, they are steering kids away from the hands-on part of the business. And the hands-on portion of the construction industry is much bigger than the clean-hands portion."

One of the things young people should realize, he says, "is that, even two years ago, the starting pay for technicians coming out of a four-year school was higher than the professional pay." Laing agrees. "Our PR is not very good," he says. "Although part of a technician's job is grimy, being a technician is a good job that has good compensation. It is not the bottom of the earth. If you are at the top of your field and go to work for a dealership, for example, the environment in there is almost spotless. There are guys making more than $100,000 a year, but that's never publicized."

The shortage of technicians has made the traditional career path from shop floor to equipment manager, "a thing of the past," he says. "They can come from the shop floor, but many of the guys don't want to get the education and training necessary to be an asset manager. I have a couple of guys who are excellent technicians, but they won't get certified by ASE. They're sitting there, and they are going to be left behind."

There could be another reason for that, as well, if Vorster is correct. He splits the equipment business into the "oil-and-grease side" and the "dollars-and-cents side." The oil-and-grease side of the business is well understood,

AEMP Honors Technicians of the Year

The Association of Equipment Management Professionals Foundation awarded three scholarships to technicians this year. Timothy Darnell Compton, a repair technician for the Virginia Department of Transportation, was named 2005 Technician of the Year.

Runner up was Gerald Schiffmacher, a fleet mechanic for the city of Peoria, Ariz., and third place went to another V-DOT technician, Graham McLaughlin.

AEMP awarded Compton a $1,000 certificate from the Foundation to be used for continuing education, a toolbox from John Deere, and other prizes. Second and third place winners also received certificates and prizes.

Compton, who also is certified through Virginia's apprenticeship program, is certified in welding and has a Master's of Truck through ASE and six automotive certifications.

He's been with V-DOT for 13 years and during that time, he says, he has seen a lot of changes. "Equipment has become more computerized," he says. "It's more of a challenge. You have to keep training and staying up with the changes. That's a challenge in itself because of the variety of equipment. It's tough to keep up at times."

Compton says he doesn't know yet how he will spend the $1,000, "but I want to find out if I can apply it toward the purchase of a laptop to do online studies and training."

Runner up Gerald Schiffmacher says, "I'm really excited about the recognition I've received in the Technician of the Year competition. I've been a mechanic since 1990, and I definitely hope one day to be an equipment manager." He has a Ford's master's, he says, an automotive master's from ASE, "and now I'm working on my heavy truck master's. When I accomplish that, I'm going to start taking management classes."

Go to www.aemp.org for more on AEMP, its Technician of the Year program, and its Certified Equipment Manager designation.

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and people who come up through the ranks have several sources for training. "But the dollars-and-cents side has been a stepchild for a long time," he says. "I don't think there is anyone out there who is doing a good job in training people for the dollars-and-cents side."

Asked if that will change in the future, Vorster says, "I hope so. I've spent an awful lot of time trying to create that change."

Gender Barrier Crashes Down

It's hard enough to come up through the ranks from shop technician to equipment manager, but Theresa F. Anderson, corporate equipment manager for Parsons, a national engineering firm in Pasadena, Calif., had additional hurdles to overcome.

She had to prove herself repeatedly in the male-dominated construction industry. She did precisely that, however, becoming the first woman to qualify for the Association of Equipment Management Professional's Certified Equipment Manager designation in 2002, and by becoming certified in a number of other areas, including electrical work, certified crane instructor and certified rigging instructor.

When Parsons bought three large construction companies and the fleets that came with them, it hired Anderson's boss, Robert Andrade, as vice president equipment/asset management. Andrade, in turn, talked Anderson into moving with him from Chicago as corporate equipment manager.



Theresa Anderson had to prove herself, but she says training helped her most in succeeding as corporate equipment manager for Parsons.

"When I was working my way up through the ranks," Anderson says, "he mentored me and embedded one thing in my brain — training. Becoming the first female CEM was a lot of hard work, a lot of studying and courses and hands-on technical training, but I did it."

Anderson, who started in the business 10 years ago, is a firm believer in training. "It's mandatory for each service technician or manager here to take at least three types of training each year," she says. "What we prefer to do is get that training directly from the OEMs. I went through Caterpillar training, John Deere training, Grove training, and others. I went to a lot of NAFA classes, administration classes, and a lot of AEMP technical training classes."

Although becoming an equipment manager is an achievement for which she is proud, she still likes to put her boots on and get in the field. "I enjoy it," she says. "I find it very rewarding, for instance, to inspect cranes. I love learning and tearing a machine apart and helping out my mechanics. I love getting dirty. All this helps me learn the asset-management part of the job. It helps me understand why the budget is what it is. It gives you a good handle for everything. You're not just a bean counter who looks at figures every day."

Anderson is helping others grow in their careers. I send them to a lot of technical training schools. I work hand-in-hand with them, and I try to teach them some of what I know. I have my mechanics going to factories for training. Actually, I have a factory representative coming here. We are paying a little extra money for that, but it's very valuable for our people to get hands-on training from OEMs."

Succeeding in a male-dominated industry, Anderson admits, is tough for a woman. "If you do not have a strong mentor, like I had, I don't think a woman has a chance," she says. "To this day, guys question my ability, even with the credentials I have. It's just a fact of being female. They are very leery about that. If I red tag a machine, I still need the backup of the vice president, at times."

Although her job can be frustrating, she still loves it, she says. "My mentor is still teaching me. What he may be teaching me, now, for example, is how to approach the operators next time in a different way so I don't get as much resistance."

Anderson constantly seeks more training and serves as chair of one AEMP's committees. "I try to keep active and try to keep involved with all my peers," she says. As for her future, she has nailed that down pretty well, too.

"I think I will become one of the best in the business. If I'm not there now, I soon will be."

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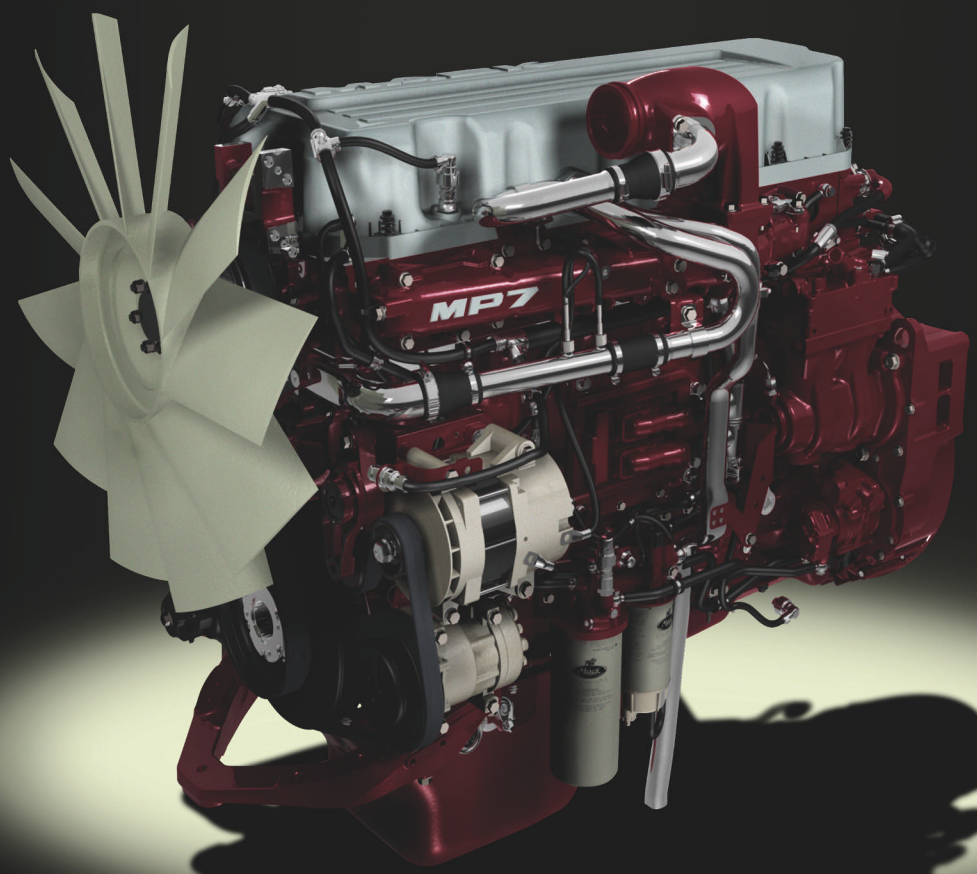

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One Road to Success

If you feel like the ice pond of your career is breaking behind you and you're skating as fast as you can to reach shore, you might be better off than you think.

Consider Steven Ricke, division manager for equipment and construction services for Hubbard Construction. He started out in the oil-exploration business, working in the west, midwest and southwest. When drilling fell off in the 1980s, he took his mechanical background and began working with heavy equipment in the coal strip mining industry in the northeast.

"I got with a start-up company called RAM Equipment and began marketing service and product support for equipment," Ricke says. Soon came double-digit interest rates and double-digit inflation, and he went to Florida where things seemed to be a little more booming.



Business savvy enables Steve Ricke to perform the corporate functions required in his position.

Photo: Bob Thompson©

"I was actually working for an equipment company, and Hubbard Construction was a customer," he says. "They needed some help and I agreed to come on board. I thought it was going to be a temporary position, maybe for about a year. And, lo and behold, 20 years later, I'm still here."

What he brought to the company, he says, was not only his mechanical background and his expertise with equipment, but also his managerial knowledge. "There are two major assets any construction company has," Ricke says. "One is its people, which are probably the biggest asset, although you can't put a dollar figure on it. The second is the iron they work, their equipment. My job is to make sure we are keeping the cost of that equipment as low as possible so we can keep a competitive edge.

"Because of that, two things are important to me," he says. "One is cost per hour, which has to be very low, and the other is uptime, which needs to be very high."

Ricke says his career has been, and continues to be, rewarding because every day is unique. "I face a different challenge every day," he says. "It's not like building widgets and every day is repetitive. There is a lot of interaction between our divisions (we have asphalt, construction and landfill) so everybody has unique challenges in regards to equipment."

Nor is it boring, he says, because there are about 110 people in the division, including 65 mechanics, "and there's always something to learn there. There's always a challenge."

Ricke credits "a little bit of mentoring and a little bit of training" for preparing him for his job. Both mentors were at Hubbard, and they prepared him to take over the position he now has. "They kept me on a path," he says. "I was also fortunate enough to get a lot of training at Virginia Tech, including a two-week Equipment Executive class that was held in Atlanta. It's been an on-going thing."

Ricke has "definitely" seen a shift in the equipment manager's job from mechanical focus to asset management. "Every equipment manager should take some type of a business class," he says. "You have to be able to understand a spread sheet, be able to look at a balance sheet, and understand your cost. The biggest challenge that I face today is still getting good information. You have to have a good record-keeping system and a good way of tracking equipment. Getting good, clear accurate information is critical."

Although a good equipment manager is more than being a good mechanic, he says, "you have to have a mechanical aptitude. When your shop mechanic comes in and explains why he is going to spend $40,000 on a bulldozer, you know why he's doing it. Otherwise, you're relying on that fellow to manage your assets."

Ricke also advises business savvy for negotiating. "You have to be a long-term thinker. For some people, long-term thinking is what they will have for lunch that day. But in this position, you have to think in terms of seven or eight years."

When it comes to gaining the skills necessary to become a good equipment manager, Ricke says he doesn't know of any "real school, except Virginia Tech. The Association of Equipment Management Professionals also is good because it provides a forum to bounce ideas around."

Ricke says equipment managers also need to think outside the box, "and a lot of that stuff — business classes, computer classes, working with different computer programs — you have to go out after yourself. The guy who was wrenching a year or two ago now has to be computer literate. Our whole industry has changed."

But that change has been for the better, he says. "It's important for us to get out there and change the perception of people in our industry. They think of mechanics and superintendents and equipment managers as grease jockeys. But that's not who we are any more. Today our mechanics have to be computer literate, have to make a huge investment in tools and have good analytical minds."



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Pressures of a Middle Man

If you can't take pressure, says Thad Pirtle, corporate equipment manager and vice president for Traylor Bros., you might as well forget about becoming an equipment manager.

"The job is a high pressure point," he says. "You are pressured by the operations people to keep the equipment in service, plus you are pressured by the owners to keep costs down and run a profitable fleet. You're always in the middle, and it takes a special kind of individual to handle that pressure and work within that environment."

Unlike engineers or technicians, Pirtle says, there is no formal training course for equipment managers. Because of that, you need to be a self-starter when it comes to finding the proper training. "It has to come from within," he says. "You have to have a passion for equipment. You need to recognize your weaknesses and prop them up with training."

Many times, he says, people within the company will guide you toward the right steps that lead to the equipment-manager position. For Pirtle, it was the owner of Traylor Bros.

"I went out of the Union Hall to Traylor for a one-day job as a mechanic," Pirtle says. "I've been with Traylor for about 23 years, 16 of which have been as corporate equipment manager."



Thad Pirtle began his career as a mechanic at Traylor Bros., but company management encouraged and enabled him to learn the necessary skills to become corporate equipment manager and vice president. Photo: Jack Grossman©

During his tenure, Pirtle has seen the requirements of the job shift from the mechanical to asset management. "I probably spend a larger percentage of my time in asset management/ownership costs than I did 10 years ago," he says. "Back then, you kept the projects moving.

"We are set up like an internal rental company," Pirtle says. "We buy and sell equipment and rent them back to the projects. We are responsible for our own P&L as well as keeping the equipment utilized. And [we distribute] ownership costs appropriately to the different operating divisions. Fifteen years ago, what I did mostly was move equipment around and keep it going on projects. There was not as much financial work involved."

Pirtle says his background and desire to succeed prepared him for the job. He grew up on a farm and was around dozers, backhoes and other equipment all his life. He attended Lincoln Technical College in Indianapolis for a year and a half to earn a degree in diesel mechanics. He brought that "passion for equipment" and training into Traylor Bros., and went from his starting position as field mechanic to field equipment superintendent, master mechanic, corporate equipment superintendent, and now corporate equipment manager.

Pirtle was the Association of Equipment Management Professional's second Technician of the Year and never forgot that experience. That award, he says, "establishes who you are, where you are, and where you stand in the industry. It kind of benchmarks you."

Because he fully recognizes the value of training and education, he expects his mechanics to attend at least two weeks of factory training every year. "It's their choice, whatever it might be," Pirtle says.

"We also have a standing order for mechanics who graduate from community colleges. We work very closely with them, and I have two or three apprentice mechanics in the shop, also journeymen who came out of local colleges. We draw heavily on that and we make training a requirement. Our mechanics must have a minimum of 40 hours of training every year."

Although many, like Pirtle, have made the transition from technician to equipment manager, he says it is difficult. In addition to the high-pressure environment, a successful equipment manager has to have a full range of communication skills and be able to deal with the financial aspects of the job.

And, Pirtle jokes, "you have to be hard-headed and like to argue a lot." CE



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By TOM BERG, Truck Editor

Terex Mixer Shows Concept's Advantages

Good visibility, decent maneuverability, and an Allison automatic make this front-discharge chassis easy to drive, but are also important to its delivery role

Front-discharge concrete mixers have been around for more than 40 years, but they're not used in many markets so they might seem foreign to many folks in the construction business. They are very American, though, and lend speed and productivity that contractors and workers appreciate.

A long time ago I was one of them. In 1976, while between writing jobs, I worked as a laborer for a small



Basic three-axle chassis mounts a 10-yard mixer and is rated for 66,000 pounds gross. This one has a front-driving axle, as do most Terex mixers. The driver controls the chute and drum speed from inside the cab, though outside controls can also be used.



It's up, in and down to the low-slung driver's seat inside the cab, which is constructed of stainless steel to resist cleaning chemicals. The mixer barrel's forward end tapers its way over the cab, funnel and chute.

contractor in northern Wisconsin. I recall odd-looking trucks with small center cabs showing up on some pouring jobs, and was impressed at how fast they off-loaded. I didn't like having to run with the wheelbarrow to keep up with them (one of the pours was too big and access too limited for the trucks' chutes to reach at first), but I admired their speed.

Only recently did I learn some of their history. In 1964, R.W. Sims, a concrete producer in Salt Lake City, Utah, invented the front-discharge, rear-engine concept and began making trucks in an operation that eventually became Savage (and later died under Mack ownership). Sims granted a manufacturing license to Jim and "Skunk" Irving, who ran a ready mix outfit in Fort Wayne, Ind. They began building the squat but nimble trucks for their own use, then for others. This company was called Riteway (the name of the mixers I saw), according to Dan Biberstine, who began working there in 1968 and now heads a competitor, Indiana Phoenix.

Riteway — meaning this is the way concrete should be delivered, in the Irvings' opinion — went through good times and bad, Biberstine related. It expanded, was sold to a company in Texas, went bankrupt, then reemerged in 1972 in Fort Wayne as Advance Mixer. Around the turn of the century there was another ownership change and bankruptcy and, in 2002, Advance was acquired by Terex Roadbuilding, the machinery maker based in Oklahoma City.

The new parent changed the product's name to Terex, and has provided valuable financial, marketing and engineering resources, said Ted Deckard, director of plant operations in Fort Wayne. Terex Advance has branched into building and installing rear-discharge mixer bodies on conventional chassis of various makes. It now employs 280 people and produces six trucks a day, four of which are the front-discharge type.

Deckard showed me the factory, where pneumatic wrenches whine and welding torches flash constantly, then walked me out to a lot full of new trucks awaiting shipment. There I picked out the one you see here. It is Terex's basic model, called FD3000 (for front-discharge, three-axle), which sports a Stars & Stripes paint scheme that he said is popular with customers.

"It's an easy truck to drive," he commented, and it certainly was, once I figured out the best way to ease my body (which has grown in poundage and girth since my laboring days) into the low-slung cab. Once seated, I admired the excellent visibility in all directions except to the very rear and, of course, well-placed mirrors took care of that.

On the three-section instrument panel, gauges are to the driver's front and left, and most controls are to the right. It's all well laid out and easy to use. Power windows are among the standard features of the Wide Workspace cab, and this one had air conditioning as well.

The cab is wide enough for a second seat, a fold-up type just to the driver's left. This allows a driver-trainer to ride along and give instructions to a new guy, and closely watch what he's doing. With the previous narrow cab, one or the other had to get to the jobsite in a separate vehicle, and the trainer then perched on the platform next to the window to shout instructions. Advance offered a two-man cab for training, but now all of its trucks go out with

TEST SET

Truck: Terex FD3000 6x6 front-discharge, rear-engine mixer, on 135,000-psi-rated main frame, empty weight 29,970 lb.

Engine: Cummins ISM, 350 hp @ 2,100 rpm, 1,450 lbs.-ft. @ 1,250 rpm

Transmission: Allison RDS 4500 six-speed overdrive w/Meritor 2-speed transfer case

Front axle: 23,000-lb. Meritor MX-23, on 26,000-lb. two-stage multileafs

Rear axles: 46,000-lb. Meritor RT-46, on 46,000-lb. Hendrickson HN-462

Wheelbase: 197 inches

Tires & wheels: Front, 445/65R22.5 Goodyear G178 on aluminum discs; rear, 11R22.5 G177 on steel discs

Brakes: Meritor S-cam w/Meritor-Wabco ABS

Fuel & water capacity: 70 & 150 gallons

Body: 10-cu.yd. Terex high-strength steel drum, w/ZF drive and Eaton hydrostatic motor



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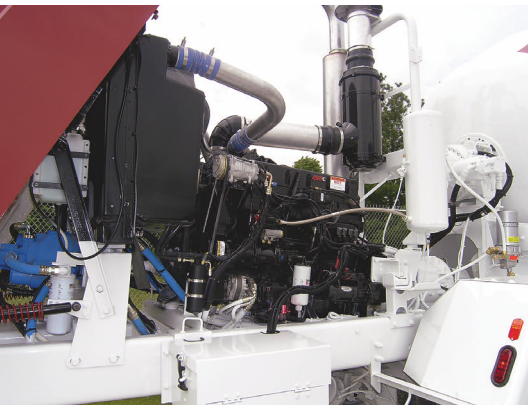
These four- and six-axle trucks are ready for a producer that operates in several states with varying weight laws. Terex offers trucks with up to seven axles.



A Wide Workspace cab gives the driver lots of elbow room. Power windows are standard, and this cab is air-conditioned. A floor-mounted lever operates the chute and a pedal (out of sight, to the left of the steering column) runs the drum. A fold-down jump seat to driver's left accommodates a trainer.



Cummins ISM-350 is popular in this type of chassis. An Allison RDS automatic is a key component because the truck sometimes moves forward and backward while pouring its load.

the 68-inch-wide cab.

The Cummins ISM diesel sits about 25 feet behind the cab, under a fiberglass hood that hangs behind the tandem, so its sounds were distant. Terex also offers Caterpillar's C11 and C13 and Cummins' lightweight ISL. But the ISM, set at 350 or 385 horsepower, is the most popular engine because it costs less than the Cats and has more torque than the midrange-size ISL, Deckard said.

I cranked over the engine, waited for it to settle into an idle, released the parking brake and punched D for Drive in the Allison automatic transmission. I headed out the gate and onto nearby county and township roads. Terex workers test each truck and mixer body with a load of crushed limestone, but this one had already been through that and its drum was empty.

Thus, the truck accelerated quickly and bounded along with ease. Its tandem sat on a stiff rubber-block suspension, so the truck bounced a lot on old, bowed concrete — ironic, given its mission of delivering that material, I thought — but was smooth over asphalt — another irony. I'm guessing that multi-axle configurations ride better, and even this one would be fine while under load. Besides, two air-ride suspensions are optional.

Sitting in the center of the chassis took a minute or two to get used to. It was an easy transition from a conventional truck with its left-hand drive, though, maybe because the chute just outside the windshield, and the funnel and other equipment above that, seemed to make the center seating appropriate. It certainly would be during a pour, though, of course, I didn't do that on this day.

Good visibility, decent maneuverability and the Allison automatic make the truck easy to drive, but are also important to its delivery role. If you've seen one of these working, you know that a front-discharge mixer drives right up to a pour site and quickly begins off-loading. The driver gets out to attach extensions to the chute, then returns to the cab to control the hydraulically powered chute and drum.

With a control lever, he raises and lowers the chute and swings it left or right, while moving the truck fore and aft to keep the end of the chute properly positioned. He speeds and slows the drum with a foot pedal next to the steering column. A manual transmission with its clutch pedal and shift lever would add considerable clumsiness to the operation, so the Allison is a key component. External controls, either mechanical or electronic, with a hand-held remote, allow someone on the crew to run the chute if he wants to, and the driver uses them to wash out the chute and funnel.

Driver operation of the chute means the contractor can eliminate one man from his crew. That and the speed of the pour save him money, and he and other contractors begin demanding that their concrete be delivered this way. So when one ready mix operator begins buying these trucks, he gains an advantage and competitors generally follow suit. This is why front-discharge mixers became popular in certain markets, mostly in the Midwest, Northeast and Florida (and, of course, Salt Lake City), but not in most others, where producers have thus far avoided them.

Partly because of the Allison, a front-discharge mixer costs more than a conventional mixer truck. But that's made up by productivity, proponents say. Because a front-discharge mixer unloads fast, it can usually haul one extra load in a work shift, boosting revenue and helping to pay off its purchase premium.

Anyway, it took me almost 30 years to move from wheelbarrow to the driver's seat of this truck. Like the guy who's been poor and rich but prefers rich, I like driving better, especially in a fast and nimble truck like this.

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By LARRY STEWART, Executive Editor

New Asphalts Ache for Pneumatic Rollers

Rubber tires knead challenging Superpave mixes and thin lifts into mats that meet tough compaction specs

Today's asphalt mixes and road designs are conspiring to make something of a hero out of the pneumatic-tire roller. The rubber-tired compactor is a specialized tool, making up less than 15 percent of all rollers working in the United States, according to the 2003 Construction Equipment Universe Study. Although there are little more than 10,000 of them at work here, and even many of their manufacturers consider the pneumatic-tired compactor to be less than glamorous, their role in highway paving is becoming crucial and choosing the right one for smaller work requires discernment.

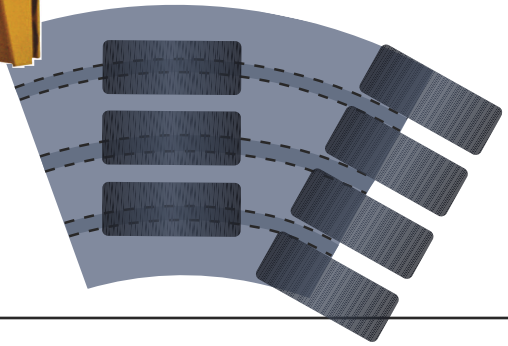
Two rows of carefully spaced tires create a kneading action, helping the pneumatic roller achieve more consistent density from the bottom of a lift of material to the surface. The proliferation in highway designs of compaction specs enforced by agencies that drill and analyze road cores has heightened attention to the compaction applied to asphalt paving.

"Rubber-tired rollers tend to compact from the bottom up because of the way the load is transferred through the lift," says Jim Scherocman, a consulting engineer with 40 years of experience in asphalt paving. "It makes sense to use one in front of a tandem vibratory roller, for example, because tandem vibratories tend to compact from the top down."

The result is a uniformly compacted lift and test results that earn contractors completion bonuses.



Sakai's GW750 remains the world's only vibratory pneumatic roller. The 20,600-pound roller moves fast, covering a 77-inch width, but vibratory energy makes it compact with force equal to that of a 55,000-pound pneumatic.



Inset: Articulated steering ensures that the paths compacted by the front and rear tires always overlap for consistent density across the machine's compaction width even in tight turns.

The recipes used to brew various Superpave asphalt mixtures have created some challenges to achieving specified road densities. Some mixes are stiff and difficult to compact because they contain a sizeable dose of crushed fine aggregate. Some coarse-graded mixes are designed with aggregate gradations below the maximum density line. These become tender — meaning the mat moves or shoves under the compactive effort — within a narrow range of temperatures commonly measured in the fresh mat not far behind the screed.

High-frequency, double-drum vibratory rollers were developed to compact quickly, before the mat cools into the tender zone. But pneumatic rollers are best for overcoming a stiff mix's resistance to compaction. And the same kneading action that works well on stiff mixes has proven effective on tender mixes.

"Various mixes, due to their propensity for pushing and shoving, cannot be compacted at specific temperatures by conventional tandem rollers," says Steve Wilson, manager of product development at Bomag Americas. "Pneumatics, on the other hand, can effectively work into this 'tender zone' temperature area, thus improving the compaction process and production."

Scherocman says that feature is nearly essential on many highway-construction projects because time is not on your side.

"Most tender zones start at 240 degrees Fahrenheit and extend down to about 190 F, but it varies widely because of mix properties," he points out. "I was consulting on a job last year in Mississippi where the mats were starting to get tender at 280 F."

The asphalt was tender at the back of the screed. There was no window for breakdown compaction with a steel-drum roller.

Even when dealing with more normal tender zones, variations in mix temperature as it is paved can leave so little time for breakdown compaction before the mat becomes tender that a contractor has no choice but to rely on a pneumatic roller.

"For example, if mix is coming out the back of the paver at 300 F on a 40 F day and you're compacting a 3-inch lift, it takes 32 minutes for the mat surface to cool down to 175 F," says Scherocman. "But if the next load of mix is 250 F behind the screed, you only have 19 minutes before it reaches 175 F."



Bomag's new rigid-framed pneumatic rollers, the BW24RH and BW27RH, steer in a staged fashion from two pivot positions on the front axle so tire coverage is maintained across their 83.5-inch widths. Both now come with automatic tire inflation.

The mat will be tender for two-thirds of that time, leaving an all-steel roller spread less than 6½ precisely timed minutes to achieve maximum density.

Time available to achieve finished compaction is dramatically shorter if the road design calls for thinner lifts. For example, 300 F asphalt going down in a 2-inch lift on a 40 F day cools to 175 F in about 16 minutes. A load that comes out of the paver at 250 F will be too cool to compact in 10 minutes.

"You have three choices for compacting tender mixes," says Scherocman. "First, you can use a tandem-vibratory breakdown roller, a pneumatic as an intermediate roller, and a static finish roller. That works very, very well under a wide variety of conditions.

"Second, you can use two tandems, and not use a finish roller," Scherocman continues. "You will have to work the vibratories side-by-side or in echelon to take advantage of temper-

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ature of the mat right behind the paver. You're gambling that you can hit the specified density before the mat cools down into the tender zone, but as we saw, that depends largely on the temperature of the mix behind the screed.

"And the third choice is to use a tandem vibratory roller in front of the tender zone and a static finish roller after it . . . and pray that the mat is consistently hot behind the paver."

Variations in asphalt plants, volume of traffic, and the vagaries of equipment breakdowns defy all efforts to consistently deliver hot mix to the paver. That's why many new rollers come with mat-temperature gauges. It's a highly recommended feature for compacting Superpave designs because a read of mat-surface temperature and a knowledge of the mix tender zone and the cooling rate of the lift will tell the roller operator how much time is available to achieve density.

Concerns that a large pneumatic roller would not be able to keep up with its high-frequency, tandem vibratory rollers inspired Sakai to add the fast-compacting power of vibration to a pneumatic's kneading action. Last year the company introduced the seven-wheeled GW750 — what continues to be the world's only vibratory pneumatic roller. A pair of eccentric shafts in each axle vibrates a specially designed set of tires. The GW750 is a 20,600-pound roller that, according to Sakai, can compact at the top of its four amplitude modes with the force of a 55,000-pound machine.

GraniteRock's Pavex division in Northern California tested and then bought the GW750 prototype in 2004. The company also bought the second machine Sakai

Pneumatic-Roller Specs (by ballasted weight)

Model	Weight (lb.) No Ballast/Max. Ballast	Compaction Width (in.)	Engine Make / HP	Maximum Speed (mph)
Mauldin 4700	3,500 / 3,675	36.5	Kohler / 18	na
LeeBoy 420	5,000 / 5,594	63	Kubota / 35	7
Basic Equipment 700	3,000 / 6,000	51	Kubota / 28	na
Sakai GW750	na / 20,580	77	Isuzu / 109	5.6
Ferguson SP-912	8,854 / 25,729	68	Deere / 80	18
Bomag BW11RH	9,975 / 27,000	68	Cummins / 85	15.5
Hypac C530AH	9,975 / 27,000	68	Cummins / 85	15.5
Ingersoll Rand PT-125R	9,095 / 27,395	68	Cummins / 85	15.5
Caterpillar PS-150C	10,775 / 28,535	68	Cat / 100	15.9
Ferguson SP-915	12,100 / 29,030	68	Deere / 80	18
Ingram AP915	13,000 / 30,000	68	Cummins / 80	16
Ingram RP915	12,480 / 30,500	68	Cummins / 80	16
Rosco Tru-Pac 915	11,500 / 30,500	68	Cummins / 85	15
Dynapac CP 142	13,230 / 30,870	69	Cummins / 99	12
Ferguson SP-915RE	12,400 / 32,025	68	Deere / 85	15
Ferguson SP-1118	11,212 / 36,102	84	Deere / 80	18
Ferguson SP-722	19,250 / 45,500	72	Deere / 121	17
Caterpillar PS-/PF-300C	30,860 / 46,200	75	Cat / 100	11.8
Dynapac CP221	18,300 / 46,305	72	Cummins / 99	14
Hamm GRW 15	25,400 / 52,900	78	Deutz / 127	12.5
Ingersoll Rand PT-240R	36,070 / 52,910	78.2	Cummins / 99	11.8
Bomag BW24RH	18,570 / 52,911	83.5	Deutz / 99	12.4
Hypac C550H	18,570 / 52,911	83.5	Deutz / 99	12.4
Caterpillar PS-360C	18,740 / 55,115	90	Cat / 130	11
Ferguson SP-728	31,600 / 56,576	72	Deere / 121	17
Bomag BW27RH	29,262 / 59,525	83.5	Deutz / 131	12.4
Hypac C560H	29,262 / 59,525	83.5	Deutz / 131	12.4
Dynapac CP271	27,340 / 59,535	92	Cummins / 99	14
Hamm GRW 18	32,000 / 61,700	78	Deutz / 127	12.5
Ferguson SP-1130	22,800 / 62,800	96	Deere / 121	17
Ingram RP930	28,500 / 63,300	95.5	Cummins / 152	12

Source: Xpanded specs at www.Spec-Check.com

Everything up to 46,000 pounds is hydrostatically driven. Of the 14 models over 46,000 pounds ballasted weight, six have powershift transmissions. The heaviest rubber-tired rollers available — Ferguson's SP-1130 and Ingram's RP930 — are hydrostats. For more specifications on pneumatic rollers and 63 other machine types, visit ConstructionEquipment.com.

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brought to North America. The company reports bonus-winning results with the unique machines. After working out the proper release agents to use on various high-spec mixes, the company has had great success using them on everything from parking lot and cul-de-sac paving to highway and airport work.

Pneumatic-Roller Costs

Size (ballasted weight)	List Price	Hourly Rate*
< 33,000 lb.	$61,514	$35.72
33,000 to 53,000 lb.	$133,090	$59.16
> 53,000 lb.	$145,288	$62.86

* Monthly ownership cost (based on list price and 5.125 percent interest) plus operating expenses (including fuel at $2.49 per gallon and $40.18 per hour for mechanic's wages) divided by 176 hours.

Source: www.EquipmentWatch.com, 800-669-3282

An issue that's important to success when using a pneumatic roller is that of mat coverage when the machine is turning. Coverage in sharp turns is an issue that becomes more critical on smaller projects such as parking lots and streets, where there are more turns to pave. When the front wheels of a pneumatic roller steer, the rear wheels may not completely overlap the space between their paths, resulting in variations in density under those areas. Some smaller rollers, such as Sakai's GW750, Bomag's BW11RH and Hypac's C530AH, Ingram's AP915 and the Rosco Tru-Pac 915 are articulated like a wheel loader to ensure that wheel overlap doesn't change.

"A straight-frame roller (not articulated) will generally be less expensive. However, it will also not provide the many benefits of articulation," says Steve Simons, communications manager with LeeBoy. "On a straight roadway chip-seal job, a faster roller for continuous back and forth motion will be efficient. For chip-seal jobs with many turns, such as parking lots or cul de sacs, articulation will be more efficient and effective."

Hydrostatic transmissions have come on strong as that technology has proven its performance and durability under heavy loads. Eliminating gear shifts removes a point at which the roller might mark the mat (a valuable feature on projects that pay bonuses based on profilograph ride-smoothness measurements) and hydrostatic drive facilitates infinite control of the smooth transition from reverse to forward and back. Today's powershift transmissions can shift quite smoothly, but roller applications seem to favor hydrostats.

All pneumatic rollers under 46,000 pounds have hydrostatic drive. Of the 14 models over 46,000 pounds ballasted weight, six have powershift transmissions. Bomag, Caterpillar, Ferguson and Ingram make hydrostats heavier than 46,000 pounds, and the heaviest rubber-tired rollers available — Ferguson's SP-1130 and Ingram's RP930 — are hydrostats.

"Higher production, relating to increased profit, has always been an issue," says Bomag's Wilson. "This has driven the industry to faster, smoother rollers and the transition to fully hydrostatic drive versus gear-train-propelled rollers."

Pneumatic rollers have long been used along with other asphalt rollers. Their inability to deliver a finished road surface relegated rubber-tired rollers to the role of niche tools. But the development of specialized tires has equipped rubber-tired compactors to do some finish rolling as well.

"We have been impressed in some areas with the pneumatic's ability to be used as a finish roller," says Wilson. "This is accomplished by the utilization of a 'flat-profile,' or more square-shoulder tire. This design tire, though not totally eliminating tire marking, greatly reduces it."

As mixes, road designs and equipment technologies advance, it makes good business sense to look at how pneumatic-tired rollers might solve some problems in new ways.

Web Resources

Find links to pneumatic-tire roller manufacturers' websites, phone numbers, and e-mail addresses in the online version of this story at ConstructionEquipment.com. Just cursor over "Magazine Archives," click on Buying File, and you'll find a link to this story.



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BOMAG

Two Big New Hydrostats

With the introduction of the BW24RH (99 horsepower, 52,911 pounds fully ballasted) and the BW27RH (131 horsepower, 59,525 pounds) early in 2006, Bomag shifted its larger pneumatic rollers from powershift transmissions to hydrostatic drive. The Deutz engine in the BW24RH delivers a few less horsepower than the Cummins it replaced. But Bomag says hydrostats require less horsepower than mechanical drive trains, that transitions between forward and reverse are smoother, and that fuel economy is improved.

Number of pneumatic-roller models: 3

New models: BW24RH and BW27RH

Product-line features: Four front tires pivot from two points when steering. Rather than responding and turning simultaneously on a solid, common axle, the inside and outside tire pairs turn at a different rate, allowing for smooth steering transitions and reducing potential to damage the mat.



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HAMM

Middle-Weight Built Heavy

The GRW 15 (52,900 maximum ballasted weight) is built on the same platform as the GRW 18 (61,700 pounds max ballasted weight), both with Deutz diesels rated at 127 horsepower and three-speed powershift transmissions. The eight-wheel compactors have identical working dimensions. Hamm says dual pivot points on the front axle improve stability and maneuverability. The GRW 15 has 2 inches of tire overlap even at half of the maximum turning angle.

Number of pneumatic-roller models: 2

Product-line features: Three-speed powershift transmissions deliver smooth shifts through a hydrodynamic drive that replaces chain drive.

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INGERSOLL RAND

Tailor Tire Load to Each Job

Ingersoll Rand covers a broad range of pneumatic compactor applications with two models, the hydrostatic PT-125R with maximum ballasted weight of 27,395 pounds, and the PT-240R with powershift transmission and ballasted weight of 52,910 pounds. Recent refinements make ballast compartments more accessible for changes. The compartments can be filled with water, wet sand, steel, or a combination of ballast material to tailor the maximum tire load to job requirements.

Number of pneumatic-roller models: 2

Product-line features: Standard skirts on the PT-240R retain tire heat to help prevent tires from picking up asphalt off the mat surface. What Ingersoll Rand calls "one-meter-by-one-meter" visibility allows the operator to see objects that are a meter tall as close as one meter to the front or rear of the compactor.



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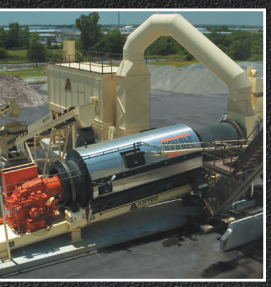


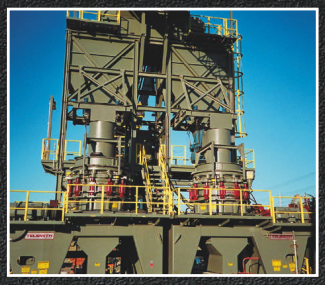



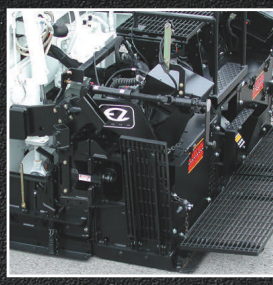

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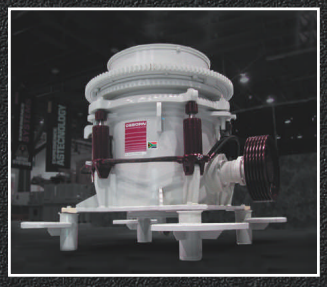





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Gallery of Pneumatic-Tire Rollers



SAKAI

World's Only Vibratory Pneumatic Roller

The GW750 is the only vibratory pneumatic-tire roller in the world, combining the kneading effect of a pneumatic roller with the high-force output of a vibratory. The relatively light GW750 (maximum ballasted weight of 20,580 pounds) moves quickly, and Sakai says it delivers the compacting force of a 55,000 pound static pneumatic roller. A vibratory shaft is housed within a series of specially designed rubber tires. The tires actually vibrate. The roller can run static, like a conventional pneumatic, and offers a choice of four amplitude settings.

Number of pneumatic-roller models: 1

New model: GW750

Product-line features: Sakai has added rubber skirts around the pneumatic tires to retain heat and help avoid pick up, and a mat-temperature sensor that can be monitored at the operator station.

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LEEBOY

New Engine Options

LeeBoy replaced the Hatz engine in its 5,600-pound 420 Roller with a 35-hp Kubota diesel and added the option of an 80-hp Caterpillar diesel to the 30,500-pound Rosco Tru-Pac 915. The Tru-Pac 915's articulated steering allows true tracking so that tires overlap in turns for full-width compaction in tight areas such as parking lots and cul-de-sacs, where LeeBoy's commercial pavers often work.

Number of pneumatic-roller models: 2

Product-line features: Water spray on the Rosco Tru-Pac 915 stops automatically when the machine stops moving and resumes spraying when the machine rolls again. The LeeBoy 420 is the only nine-wheel roller under 25,000 pounds.

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INGRAM

Rigid or Articulated Choice At 30,000 Pounds

Ingram builds two pneumatic rollers with about 30,000 pounds of ballasted weight — the rigid-framed RP915 and the articulated AP915. The third machine is the rigid-framed RP930 at 63,300 pounds. On the AP915, Ingram says its "Center Pivot Articulated Power Steering" produces full wheel coverage in tight turns to compact areas that rigid-frame rollers cannot reach.

Number of pneumatic-roller models: 3

Product-line features: All of the Ingram pneumatic rollers are Cummins powered with hydrostatic drive systems. The optional three-position "Memory Water" spray control automatically starts the flow when the machine is in motion and turns it off when the machine stops.

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Gallery of Pneumatic-Tire Rollers

HYPAC

New Hydrostats with Automatic Air

Deutz engines replaced Cummins power in the 52,900-pound C550H and 59,500-pound C560H introduced early in 2006. These two larger Hypacs also changed to hydrostatic transmissions, making the entire Hypac pneumatic line hydrostatic.

Number of pneumatic-roller models: 3

New models: C550H and C560H

Product-line features: Like the matching Bomag machines (the Hypac brand is owned by Bomag), the C550H and C560H come with automatic tire-inflation systems as standard equipment. These systems constantly monitor and maintain tire pressure automatically, and allow pressure changes while the roller is rolling.

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DYNAPAC

Sister Models Compact 72 And 92 Inches Wide

Dynapac's CP221 and CP271 are two machines separated by more than 1,300 pounds of ballasted weight but with some striking similarities. The CP221 is rated at 46,305 pounds, with 99 Cummins horsepower and powershift transmission. The CP271 is rated 59,535 pounds, also with a 99-hp Cummins engine and powershift. The seven-wheel CP221 delivers the same per-wheel load as the nine-wheel CP271.

Number of pneumatic-roller models: 3

Product-line features: Dynapac's smallest roller, the hydrostatic-drive CP142 has a modular ballast system comprising eight sealed ballast containers to allow visual control of wheel loads.

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CALDER BROTHERS

Loads Side-by-Side With Another Roller

Calder's Mauldin 4700 is a seven-tire utility roller that loads side-by-side on a standard equipment transport with a 2-ton roller. The 3,675-pound roller is matched to Calder's Mauldin commercial pavers, with 22-inch tires and a compaction width of about 3 feet.

Number of pneumatic-roller models: 1

Product-line features: The Mauldin is powered by an 18-hp Kohler, air-cooled, gasoline engine and delivers drive to the tires through a hydrostatic transmission.

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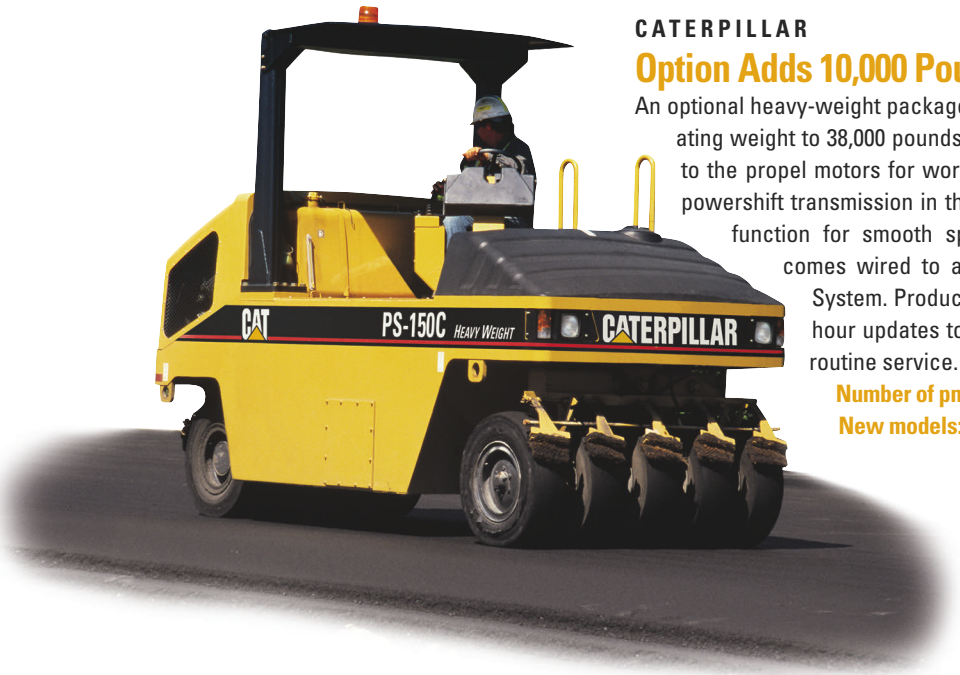

CATERPILLAR

Option Adds 10,000 Pounds to PS-150C

An optional heavy-weight package can increase the PS-150C's maximum operating weight to 38,000 pounds. Load-compensating valves increase torque to the propel motors for working on grades and on tough underfoot. The powershift transmission in the PS-300C and PF-300C has a new soft-shift function for smooth speed and direction changes. The PS-360C comes wired to accept the optional Caterpillar Product Link System. Product Link provides remote, wireless location and hour updates to assist in tracking machines and scheduling routine service.

Number of pneumatic-roller models: 4

New models: PS-360C, PS-300C, PF-300C and PS-150C

Product-line features: Standard 500-hour oil-change intervals on Cat engines throughout the line reduce downtime and maintenance costs.

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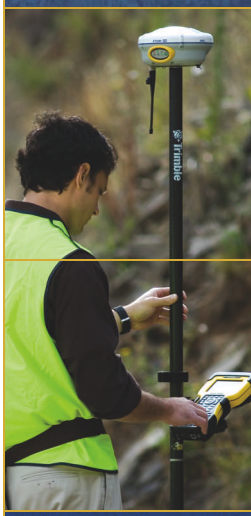

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By WALT MOORE, Senior Editor

Compact Excavators

VOLVO

The Volvo range of compact excavators has a mix of types. Seven "standard" models range in operating weight from 3,882 to 11,750 pounds. The line also includes four short-swing-radius models, ranging in weight from 6,219 to 18,739 pounds. Also included in the line is the EW55B, a wheeled machine with 51 horsepower and an operating weight of 12,125 pounds. The EW55B digs to 13.8 feet with its long-arm option.

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JCB

JCB's new 8040ZTS and 8045ZTS, both zero-tail-swing models, weigh in at 9,480 and 10,472 pounds, respectively. Both use a 46-hp, Tier-2-compliant diesel engine and provide digging depths of 10 feet 11.5 inches and 11 feet 7.5 inches, respectively. Both feature load-sensing hydraulic systems.

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BOBCAT

The Bobcat 323, on the small end of the company's 12-model compact-excavator line, weighs in at 3,655 pounds and uses a three-cylinder, 13.3-hp engine. Maximum digging depth is 7.5 feet, and ground-level reach is 12.8 feet. The 323 is equipped with a variable-displacement, dual-outlet piston pump/gear pump package and uses two-speed drive motors.

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YANMAR

The Vi045-5 and Vi055-5 zero-tail-swing compact excavators have operating weights of 10,100 and 11,300 pounds, respectively. High-strength boom side plates are 50 percent thicker than previous models, says the company. Larger engine-hood covers facilitate maintenance access, and hydraulic hoses are recessed and protected by removable covers.

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TAKEUCHI

Takeuchi has been manufacturing compact excavators since 1971. Operating weights for the current eight-model lineup of machines range from 2,029 to 31,878 pounds and digging depths range from 5.5 to 18 feet. Standard features include control-pattern change valves, tilt-up operator's compartments and emergency-shut-down systems.

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VERMEER

The seven-model family of compact excavators ranges from 18 to 52 horsepower (all are equipped with Kubota diesel engines) and from 3,307 to 11,023 pounds in operating weight. The CX218 and zero-tail-swing CX219z have variable-width tracks, which extend from 40 to 51 inches. All models are equipped with an angled backfill blade that provides two positions (15 and 30 degrees) on either side of the centered position. Bolt-on blade extensions allow working at a greater distance from the ditch when backfilling.

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CATERPILLAR

The new 304C CR (compact radius) mini-excavator (shown), along with its companion models, the 303C CR and 305C CR, feature bucket digging forces as much as 22 percent higher than those of previous models. The new minis have load-sensing hydraulics, and the auxiliary-hydraulic system has a two-way circuit as standard equipment. A rotate circuit is optional. Operating weights vary from 7,800 to 11,700 pounds and net-horsepower ratings from 29.5 to 47 horsepower.

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HITACHI

The ZX75US zero-tail-swing excavator has a 54-hp engine and delivers 12,350 pounds of drawbar pull. It also has the company's HIOS engine/hydraulic system that adjusts power delivery and balances hydraulic pressure and flow. Cab features include climate control with an automatic, high-capacity blend-air system.

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KUBOTA

Kubota's 2006 mini-excavator lineup will include three new zero-tail-swing models — the Super Series U15, U25 and U45. These new models will compete, respectively, in metric-ton classes 1.5, 2.5 and 4.5. The U15, which features hydraulically adjustable tracks, weighs in at 3,700 pounds and digs to 7.6 feet. Its companion models dig to 9.3 and 11.8 feet, respectively.

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JOHN DEERE

Compared to its C-Series predecessor, the new 27D hydraulic excavator, with an operating weight of 6,400 pounds, features cycle times as much as 18 percent faster, 50 percent more drawbar pull, and automatic shifting between low- and high-travel ranges. With a 26-net-hp Yanmar diesel engine, the 27D has a "long-arm and counterweight" option that allows digging depths to 9.6 feet.

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NEW HOLLAND

Five compact-excavator models range in horsepower from 11.9 to 40.8, and in operating weight from 3,240 to 10,275 pounds. These units are equipped with water-cooled Yanmar engines and use two variable-displacement piston pumps. A two-position bucket can be adjusted for maximum breakout force or for maximum working range.

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THOMAS

Thomas' six-model range of compact excavators has operating weights from 3,236 to 16,425 pounds and horsepower ratings from 17 to 59. The top-of-the-line model 75 features pilot-operated control levers, a four-cylinder, liquid-cooled Kubota diesel engine, and a regenerative hydraulic system for the digging arm designed to reduce cycle time. Model 75 digs to 13.8 feet.

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KOMATSU

The PC18MR-2, PC20MR-2 and PC27MR-2 compact excavators have operating weights of 4,090, 5,060 and 6,590 pounds, respectively. They all use Komatsu engines, rated at 15, 20 and 25.5 horsepower. These machines also feature Komatsu's HydrauMind hydraulic system, which is designed to provide enhanced controllability.

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INGERSOLL RAND

Rated at 72 horsepower and weighing 16,538 pounds, the ZX-75 has a maximum digging depth of 13.9 feet. It is equipped with a dozer blade (with float control) and can be fitted with either rubber or steel track pads. Push buttons in the cab allow the operator to select the favored operating pattern and to "activate either high- or low-flow hydraulic pressure depending on attachment requirements."

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CASE

Case offers five models of zero-tail-swing, CX-Series compact excavators, ranging in engine capability from 11.9 to 40.8 horsepower and in operating weight from 3,240 to 10,261 pounds. CX models are equipped with a two-speed drive system and hydraulically controlled backfill blade. The machines feature pilot-operated joystick control levers and a pattern selector valve to accommodate operator preferences.

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GEHL

Gehl's 10-model line of compact excavators ranges from model 153 with 18 horsepower and an operating weight of 3,759 pounds; to model 1202 with 99 horsepower, an operating weight of 25,397 pounds, and a maximum digging depth of 15.7 feet. Models 223 and 373 feature a "house-leveling" feature, which enables more precise side-hill operation and allows digging vertical trenches without the need for benching or filling.

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TEREX

Model HR3.7 features a zero-tail-swing design and has an operating weight of 8,200 pounds and a dig depth of 11 feet. The engine is a Mitsubishi four-cylinder diesel rated at 32.5 horsepower, and the implement hydraulic system is a load-sensing type using variable-displacement piston pumps and closed-center, flow-compensated valves.

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DITCH WITCH

Ditch Witch compact excavators range in operating weight from 4,100 pounds on the MX182 to 11,100 pounds on the MX502 (with canopy), and in horsepower from 15 to 39. The MX182 (shown) features a heavy-duty X-track frame and digs to 7.1 feet. It measures 51 inches wide, and overall height is 95 inches.

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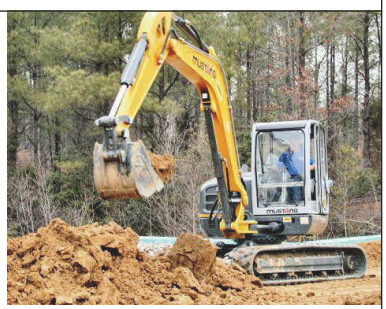

MUSTANG

Among Mustang's newest machines are the 7503ZT and the 8003 (shown), which have operating weights of 16,200 and 17,400 pounds, respectively. The 7503ZT is a zero-tail-swing model and digs to 13.2 feet; the 8003 digs to 14.1 feet. Both machines use a 69-hp Yanmar engine.

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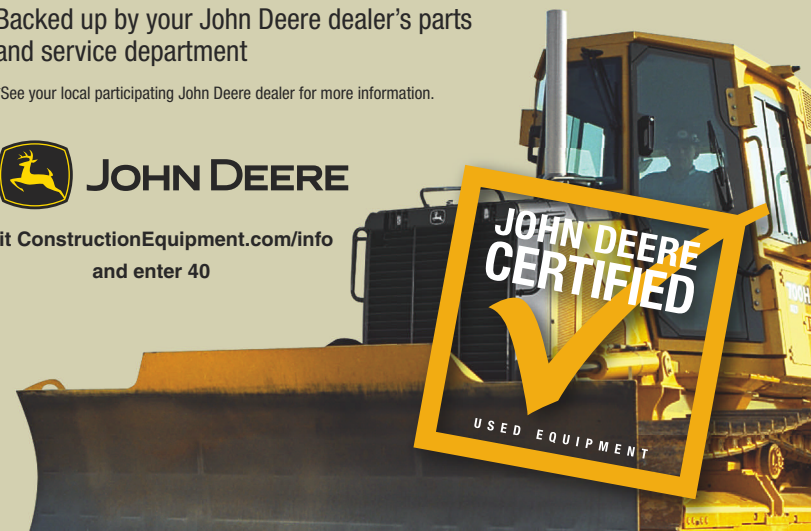

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NEW HOLLAND

By MIKE VORSTER, Contributing Editor

Focus on Functions to Improve Performance

Machine management is a multi-tiered role. Applying expertise to each individual aspect can ensure optimum execution

Last month, we described six functions (illustrated as a hexagon) that must be competently performed in order to manage a fleet of construction equipment. We will continue with that theme and show how a focus on functions can help define roles and responsibilities to ensure that everyone knows what they are supposed to do.

Many companies define fleet management as a separate organization with responsibility for all six functions and accountability for the attainment of three goals: Equipment must be in the right place at the right time; equipment must achieve stated levels of reliability and uptime; and total owning and operating cost must be kept to a competitive minimum.

The six functions are combined or "bundled" within one organization that charges a single defined and agreed upon hourly rate for the equipment used by projects. Under the right circumstances, the system works well (see "When Centralization Makes Sense," December 2004 or online at ConstructionEquipment.com). The devil is, as ever, in the details. The cost reliability and uptime of equipment is a constant source of debate. Accountability clashes with authority, and a stovepipe mentality soon develops with neither equipment nor operations recognizing the challenges faced by the other.

An alternative approach to a strongly centralized equipment organization can be developed by focusing on the functions and deciding which parts of the organization are best able to manage cost and achieve the desired results. The functions in the hexagon are split or "unbundled" and a separate cost control, budgeting, and cost-recovery system is developed for each. Principal stakeholders are identified and they work together to ensure that each function supports company objectives. Consider how it works, or could work, for each function.

1. Acquisition and Disposal. This is basically a procurement function. The individuals concerned must maintain relationships with manufacturers, dealers, brokers and finance houses, and they must be able to negotiate the best deal possible. They develop technical and commercial procurement contracts and acquire or dispose of equipment.

Operations and equipment are both stakeholders in the process. The former ensure that the equipment is able to produce the required quantity and quality of work; the latter ensures that the equipment can be supported in the field and is consistent with fleet standardization policies. The function can reasonably be seen as a corporate overhead with budgets and control mechanisms established to suit.

2. Compliance and Risk Management. This is an administratively intense clerical function. The individuals concerned must be fully knowledgeable of all statutory requirements and must ensure that each machine is licensed, insured, inspected and certified as required. Their objective is to reduce exposure to risk and ensure that corporate assets can be legally operated wherever they may be. This function can also be funded and managed as a corporate overhead.

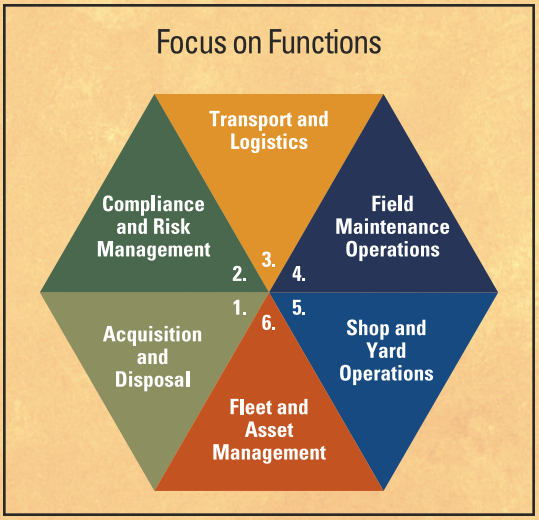
3. Transport and Logistics. Mobilizing and moving equipment is a project responsibility. This function is thus best managed by operations with costs charged directly to jobs. The cost of moving equipment as well as the cost of the people who apply for permits, track the current location of equipment, and manage the process should not form part of the equipment owning and operating rate. This function and its cost are best managed by the projects and operating business units responsible for fleet utilization.



Mike Vorster

David H. Burrows Professor of Construction Engineering and Management at Virginia Tech. See Constructin Equipment.com for full archives of "Equipment Executive."

Splitting the functions, and defining stake holders, objectives and revenue streams for each, makes it possible to focus expertise on the task at hand.



An effective equipment-management strategy must include these six functions. How those functions are accomplished is a matter for internal debate.

4. Field Maintenance Operations. This is the first and, in many ways, the most important of the pure equipment-management functions. It includes fuel, ground-engaging tools, daily lubrication and fluids checks, inspections, adjustments and preventive maintenance. Operations and equipment are stakeholders in the process: Both want it done well, and both know it is the first line of defense against unplanned failure. Scheduling of the necessary work requires careful coordination, and field mechanics truly serve two masters.

Large projects justify the full-time on-site presence of field mechanics integrated into the project team and responsible for all field maintenance operations. When this happens, a project-level account is established to receive the true cost of field maintenance operations. Costs are balanced against the "income" received from a component of the hourly operating rate, and the project is responsible for any over- or under-recoveries. This aligns responsibility and accountability, but it does, of course, require a clear definition of maintenance standards and policies and a mechanism to ensure that these are followed regardless of project cost or time pressures.

5. Shop and Yard Operations. This is the second of the pure equipment-management functions and covers the work needed to receive equipment; refurbish, repair or rebuild it; and make it ready for its next assignment. Shops and yards are easy to unbundle and are frequently managed as responsibility centers with costs allocated, managed and controlled using a standard work-order process. True costs are set against individual machines and compared with an "income" received from the hourly operating cost recovery rate.

Some shops seek to balance their books by charging a fully burdened rate for mechanics and thus behave much like outside repair facilities. This seldom, if ever, leads to good results as budgets can be balanced by allocating time and efficiency easily becomes a secondary consideration.

6. Fleet and Asset Management. Unbundling this function and considering it a separate specialized function gives it the stature it deserves in the organization. The equipment asset in a heavy construction company accounts for about one-third of total corporate assets, and the cost of owning and operating the fleet is frequently larger than any other single project.

Fleet and asset management is a specialized function. It uses and processes data generated in other functions to make unit-level decisions about rebuilding or replacing machines, balancing fleet average age, and adjusting fleet size and composition to meet changing company demands.

There are three very clear stakeholders. First, the managers responsible for field-maintenance operations and shop and yard operations must be involved and contribute their knowledge of the mechanical condition of the assets. Second, project managers and production specialists must be involved and contribute their knowledge of the assets' ability to perform reliably and achieve production targets. Third, corporate financial managers must be involved and contribute their knowledge about capital investment targets, tax, financial structure, market opportunities and strategic planning.

Decisions made in this function define the size, age and composition of the fleet; drive repair, rebuild, replace decisions; and set requirements for acquisition and disposal. Success in this function is crucial to the success of the company as a whole.

Combining the six functions into one organization with clear objectives and a single revenue source based on the internal rental rate is simple and straightforward. Simplicity can be a strength. But it can also be a weakness. Splitting the functions, defining stake holders, objectives and revenue streams for each, emphasizes the many facets of fleet management and makes it possible to focus expertise on the task at hand.

To quote a famous advertisement, "There are no simple solutions. Only intelligent choices."

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By ROD SUTTON, Editor in Chief

Maintainability Excels with E Series

Case wheel loaders tout serviceability enhancements, increased material retention and operator comfort

Case unveiled the first in its new E Series wheel loaders at its Tomahawk, Wis., facility in June. Models 721E, 721E/XT and 821E replace their 721D and 821C counterparts with Tier III diesel engines, more material retention, and improvements in operator comfort and serviceability.



Case 821E allows operators to match power to fuel economy. In high-production activities such as aggregates operations, they may choose maximum power at all times for high breakout force and fast cycling.

Marketing manager David Wolf says Case used Society of Automotive Engineers' maintainability measures to evaluate such variables as change intervals, tools required to do various maintenance operations, and the number of access compartments to be opened. Based on those studies, he says, the loaders offer "best-in-class maintainability."

In focus groups and one-on-one interviews, maintainability came across as a high need. "Service techs are very vocal on their frustrations," Wolf says. "If I can get the service tech in the buying process, he's a great ally." The new loaders have improvements such as three remote drains for coolant and engine and hydraulic oil that are ganged at ground level.

Key to the company's ability to make such maintainability claims is the mid-mount cooling module, which allows the engine to be moved behind the rear axle, opening up the opportunity to slope the loader's hood. The one-piece hood is then electrically actuated to provide easy access to both the engine and the daily maintenance checkpoints. "The only tool required for service checks is a rag to wipe oil off the dipstick," Wolf says. New to the cooling module with the Tier III engine is a fuel cooler, positioned near the firewall.

The 6.7-liter Case diesel (providing 183 and 213 horsepower, respectively) gives the loader three power curves (max, standard and economy) and four work modes (max, standard, economy and auto). In auto mode, the electronically controlled engine adjusts between power curves to move the maximum amount of material per pound of fuel. Overall fuel efficiency has been improved between 5 and 8 percent.

Case teams the new engine with ZF transmission and axles for a "matched power train," Wolf says. "Limited-slip axles on the front and rear transfer power automatically from the wheel that's slipping to the wheel that is gripping," he says.



One-piece flip-up hood, a lift-up panel over the tire, and a removable inner tire fender give the E Series "best-in-class" maintainability, says Case.

In addition, Case has moved the planetary and the wet-disc brakes outside the frame for improved serviceability and machine stability. "The emphasis is on serviceability," Wolf says. "It can be done at the wheel end instead of having to drop an axle."

E Series operators will find a larger cab with more creature comforts, including an in-cab cooler box that has a diffuser to

run hot/cold air. Access has been improved by angling the step 5 degrees, Wolf says. "We're driving for operator comfort."

Inside, features include a tilt steering column and infinitely adjustable seat, arm rests and control placement. Floor-to-ceiling glass enables the operator to see all around the machine, providing "a clear, direct view to the front tires and to the bucket edge," Wolf says. Cab door and right-hand windows swing back 180 degrees for maximum cross ventilation.

On the loader end, Ride Control keeps operators from bouncing during travel functions. In the lift cylinders, oil goes through an accumulator and the arms then act like a shock absorber, Wolf says. Ride Control can be set for full-time or auto modes. In auto, the system kicks in after 3 mph.

Also on the loader end, Case redesigned the bucket to improve cutting and material retention. The bolt-on cutting edge was extended and thinned, enabling it to push into a pile more efficiently. The bottom floor plate is set at a 5-degree angle to smooth the transition of material from the cutting edge to the back curvature of the bucket. "This creates more rolling of the material to fill the bucket more rapidly," Wolf says.

Retention is further improved by raising the hinge pin, he says. E Series has the pins up out of the dirt, which keeps them cleaner and also provides for more efficient curling and loading.

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E Series Specifications

Model	Net HP	Operating Weight (lb.)	Bucket Capacity (cu. yd.)
721E	183	30,644	3.01
721E/XT	183	31,574	3.00
821E	213	37,844	3.78

Model	Net HP	Operating Weight (lb.)	Bucket Capacity (cu. yd.)
721E	183	30,644	3.01
721E/XT	183	31,574	3.00
821E	213	37,844	3.78

Source: Case Construction Equipment

The first loaders in Case's E Series compete in the 175-200-hp and 200-225-hp ranges. For more wheel-loader specifications, and 71 other types of machines, visit ConstructionEquipment.com.



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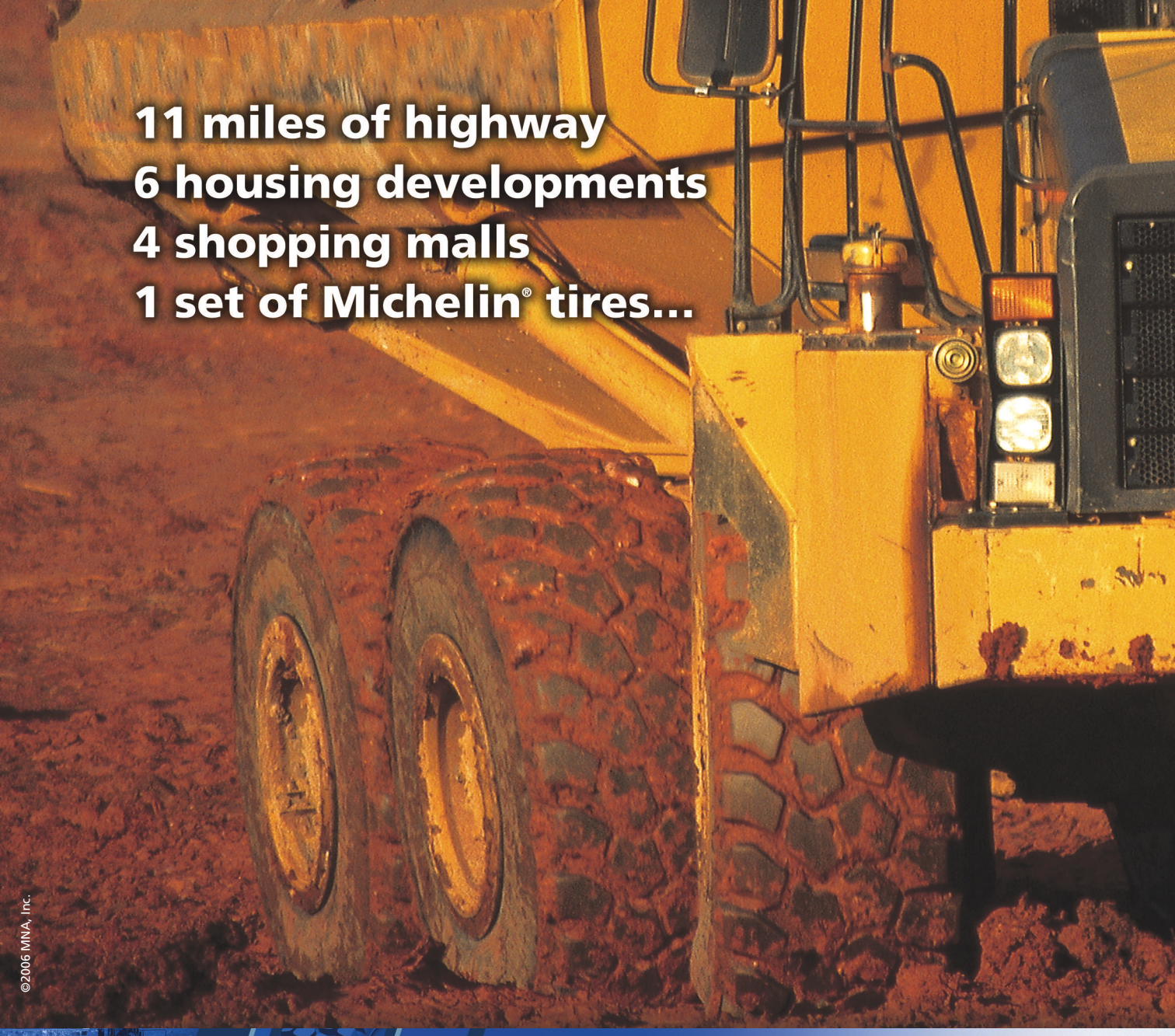

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By HEATHER BURLINGAME, Senior Production Editor

Reformulated Motor Oil for '07 Diesels

Shell's Rotella T transitions from CI-4 Plus to CJ-4

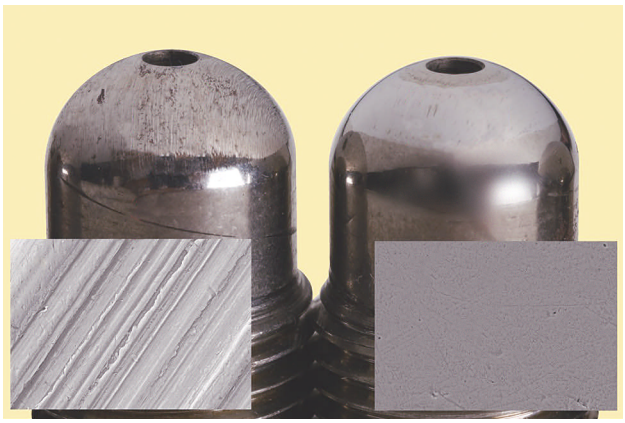
As ultra-low-sulfur diesel fuel enters the pipelines, Shell announces its latest motor oil for heavy-duty diesel engines.

Rotella T meets the new CJ-4 category — a requirement for 2007 on-highway diesel engines — for diesel motor oil, as well as several OEM requirements for low-emissions diesel engines. CJ-4 oil can be used in pre-2007 engines, too. In fact, Shell recommends it, saying the CJ-4 oil provides increased performance over CI-4 Plus oil. Drain intervals remain the same. For fleet managers with on- and off-highway diesels, CJ-4 oil can be used for the entire fleet, says Shell.

It's acceptable (not necessarily recommended) to mix CI-4 Plus with CJ-4 oil, depending on the engine model and if it is a pre-2007 engine. New '07 engines, for example, must use CJ-4 oil, and it's safe to stick to CJ-4 for warranty purposes as well. However, if it is absolutely necessary to top off with CI-4 Plus oil, Shell recommends changing the oil as soon as possible.

Benefits of using CJ-4 Rotella T include what Shell calls "Triple Protection" technology, which helps control wear, deposits and emissions, according to the company.

Through 5.5 million miles of on-highway testing and laboratory tests, Shell figures that Rotella T provides an average of 50-percent more wear protection for valve-train components than CI-4 Plus oil. During Cummins ISM engine testing, the injector screws showed little wear, according to Shell.



During the Cummins ISM engine test, valve adjuster screws showed less wear and scratching with CJ-4 Rotella T (right) when compared to another passing CJ-4 oil (left).

To help keep sludge and deposits minimal, the new oil formulation contains 30-percent more ashless chemistry than the previous formulation. Rotella T also provides increased soot-related viscosity control, says Shell. The detergent system is designed to control high-temperature piston deposits and minimize blockage in the diesel particulate filter (DPF) in '07 engines.



Shell's CJ-4 Rotella T provides what the company refers to as "triple protection" to control wear, engine deposits and emissions. Designed for '07 diesel engines, the oil works for pre-'07 diesel engines and off-highway equipment, as well.

Created to help '07 diesel engines meet the new emissions requirements, the DPF exhaust after-treatment device works as soot attaches to its wall and engine-oil ash sticks on its face. As with all filters, the DPF requires periodic cleaning, though the only standard of yet is the minimum of 150,000 miles required by the EPA.

Because a blocked DPF can cause higher exhaust backpressure, increased fuel consumption and loss of engine power, motor oil can become an important factor in reducing ash buildup in the DPF. Shell claims CJ-4 Rotella T does just that.

CJ-4 Rotella T became available in bulk and drums July 1 and will be available in quart, gallon and pail packages by Oct. 15. CI-4 Plus Rotella T will continue to be available in bulk and drums.

Shell plans to introduce another new heavy-duty diesel CJ-4 motor oil — Rimula Super — this year.

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BUCKLE UP

By LARRY STEWART, Executive Editor

Cummins Powers World's Strongest Skid-Steer

Increased torque and rated load keep Gehl's 7810E skid-steer on top

When you need a skid-steer loader and size really does matter, there's nothing bigger than Gehl's 7810E. The change of engines to a Cummins turbo diesel actually dropped horsepower 15 percent to 99 (avoiding Tier-3 emissions requirements for the time being) but increased torque by 5 percent. But the 7810E retains the most powerful engine of any competitor's skid-steer by a significant margin, and Gehl raised its SAE rated load capacity 5 percent to 3,850 pounds.

Gehl's 7810E (and the Mustang 2109 — the same machine marketed in Mustang colors) tops the industry in:

- Rated load capacity (12 percent more than the Mustang 2099, and 18 percent more than John Deere's 332)
- Net horsepower (14 percent greater)
- Peak torque (18 percent greater)

There are hydraulic systems that match the 7810E Skid Loader's 3,300-psi hydraulic operating pressure, but none delivers more than its 29 gallons per minute of auxiliary flow. Deere and Bobcat offer high-flow options that rival the big Gehl's optional 41-gpm high-flow system.

At 10,520 pounds of operating weight, the 7810E is a serious load for a skid-steer loader. The Mustang 2099 — a smaller Gehl-built machine — shaves about 3 percent of that weight, and the nearest competition weighs 1,360 pounds less (nearly 13 percent).

Compact wheel loaders are likely to be the 7810E's greatest competition. Suggested retail price of the skid-steer is at or below the price of wheel loaders with half or a third less engine horsepower. The 7810E offers 1,500 pounds or more tipping load than these small wheel loaders, and significantly more loading height. It takes a much more expensive wheel loader to equal the 7810E's tipping load.

Its engine is comparable with large compact track loaders. The 7810E equals or exceeds the rated operating capacity (at half of tipping load) of all but the five largest compact track loaders.



Vertical-lift linkage on Gehl's 7810E skid-steer provides consistent forward reach throughout the lift cycle and more dump reach (38.2 inches) at maximum height than any other skid-steer.

Operations that demand the maneuverability of a skid-steer loader will not find a machine more productive than the 7810E. Two-speed drive is available, pushing ground speeds up to 12.5 miles per hour. With a 55-inch wheelbase (largest in class) and optional Hydraglide ride control, or lift-arm suspension, Gehl claims the big machine rides smoothly.

Four choices of controls are available: pilot-hydraulic joysticks, dual-hand, hand-foot, and Gehl's T-bar control.

Manufacturer's suggested list price on the 7810E is expected to be $49,700.

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Competitive Skid-Steers (by tipping load)

Model	Tipping Load (lb.)	Height to Bucket Pin (in.)	Bucket Breakout (lb.ft.)	Engine HP / Torque (ft.lb.)	
Bobcat S300K	6,111	129	5,400	Kubota	81 / 217
Case 465	6,000	126	6,175	Case	82 / 263
New Holland L190	5,600	126	7,670	New Holland	74 / 236
John Deere 332	6,350	127	8,210	Deere	85 / 251
Mustang 2099	6,800	142	7,880	Perkins	86 / 223
Mustang 2109	7,750	142	7,880	Cummins	99 / 305
Gehl 7810E	7,750	142	8,340	Cummins	99 / 305

Source: Xpanded Specs at www.Spec-Check.com

Even with a drop to 99 horsepower, Gehl's new 7810E is more powerful than any skid-steer and most compact wheel loaders and compact track loaders.

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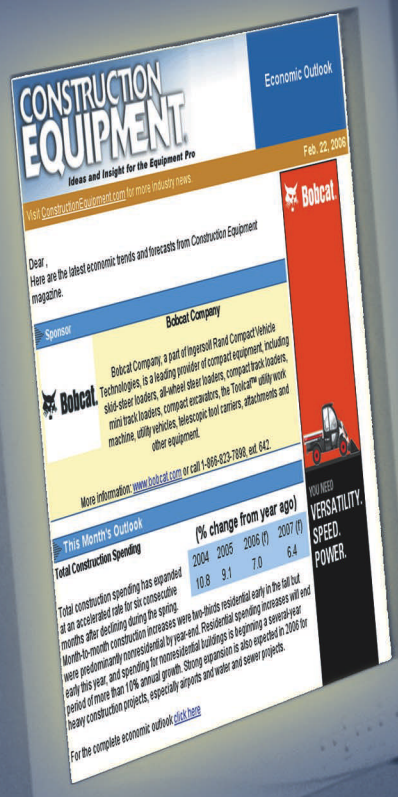

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Market Watch Lite

By HEATHER BURLINGAME, Senior Production Editor

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John Deere

John Deere Worksite Pro Roller Level attachments feature box blade with roller level that can grade without hydraulics. Available in 66- and 84-inch widths, models RL66 and RL84, respectively, can be used on both smooth and sloped surfaces, the company says.

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Baldwin

PureForce hydraulic filtration line includes filters, bases and indicators. Filters offer high ratings in burst and impulse tests and are designed for use with Baldwin die cast aluminum bases. Filters, with the L-Lock hem, come in 4- and 5-inch diameters and are rated at 500 and 350 psi, respectively. Bases incorporate steel studs that provide additional strength and flow properties. Indicators come in visual and electrical styles.

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Allied Construction Products

Hammerhead II Model HB 550 is a self-contained, hydraulic, "concrete-slab buster" designed to "rubblize" concrete flatwork up to 12 inches thick on driveways, bridge decks and roadways. Designed to operate either vertically or horizontally, it can deliver "up to a 4,000-foot-pound energy class impact force."

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Atlas Copco

Five new models in the single-axle HardHat line of oil-injected, rotary-screw portable air compressors feature an impact-resistant canopy for protection against jobsite damage. Weighing 1,627 to 1,950 pounds and powered by 21- to 49-hp John Deere diesel engines, the compressors deliver an airflow between 92 and 189 cfm at a working pressure of 102 psi. All models are fitted with a fully automatic engine regulator that constantly varies the engine speed according to air demand, thereby reducing fuel consumption.

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Michelin

The X-Crane AT tire for self-propelled all-terrain cranes features rubber compounds that give the tires better rolling resistance, says Michelin. When compared to its predecessor, the XGC, the X-Crane AT has a longer service life, thanks to more evenly distributed ground-contact pressures that provide regular wear of the tread pattern. The tire is available in 445/95 R25.

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J.W. Speaker

Model 265 LED lamp combines stop, tail, turn and back-up functions in a low-profile design. It is sealed when mounted to resist the elements and conforms to ECE and SAE standards. The lamp doesn't require bulb replacements, and users can mount it with two M6 bolts.

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Market Watch Lite



Atlas Copco

At the jaw tip, the CC 1700 demolition attachment exerts a cutting force of 220 tons. It uses a single-pin, jaw-retention design that improves visibility, trims tool weight and reduces the time required to switch between sets of cutting jaws. Both universal and steel-cutting jaws are available, the latter having a jaw opening of 17 inches.

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Trimble

GCS600 is an entry-level product designed to provide a grade-control solution for elevation and slope applications. It is easy to install, set up and use on excavators with standard buckets or tilt buckets. With the AS300 Angle Sensor, GCS600 works with articulated booms or tilt buckets. It displays required depth and working slope, and lets the operator work across a greater area and slope distance without returning to the laser transmitter each time the machine moves.

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Dieselcraft

The two-stage fuel-purification system removes large solids and water and reduces asphaltene-particle size. The high fuel-return rate of most diesel engines allows continual fuel filtering. There are no filters to replace or check. Seven models from 5 to 2,500 gph are available.

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OEM Controls

New modules work with Service Tracker module. Tracking module collects jobsite information such as equipment hours and fuel usage. Capture module is a PDA that accepts bar code or infrared data input for data like location and cost codes. Delivery module automatically downloads and transmits data via the Internet. Managing module includes tailored software for use in operations and equipment reporting.

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Karcher



Three models feature a cleaning range of 2 to 3.5 gpm. All have a rugged steel chassis and cage painted with an epoxy powder-coat finish for all-weather protection. As with other Karcher pressure washers, the new series has industrial-grade components. Industrial-grade motors with 120V and 230V single-phase configurations power the units. The models come with a five-year warranty.

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Kaeser



M26 Mobilair portable compressor has reduced noise levels while delivering up to 90 cfm at 100 psig. Standard are the Sigma Profile airend, Kubota diesel engine, and patent-pending anti-frost control. A canopy allows for quick access to service points and reduces noise.

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Leica



GradeSmart 3D V 5.2 for dozers and graders is intended to improve the product's ease of use. Formerly known as GradeStar, GradeSmart features SiteSmart software, which streamlines the data-transformation process to improve operation speed, support and usability. SiteSmart - Translator supports 1200 series data, which means that jobs prepared on a Total Station or GPS1200 can be imported by the translator and incorporated into GradeSmart.

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Atlas Copco



With a service weight of 1,210 pounds, the PB 530 Penta Series breaker is designed for skid-steers, backhoes and mini-excavators in the 9- to 15-metric-ton weight class. It has an impact rate to 1,100 bpm and accepts a maximum hydraulic flow of 26.4 gpm at a pressure of 2,175 psi. Elastic elements between the percussion mechanism and box enclosure provide acoustic insulation to reduce sound and vibration.

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Market Watch Lite



Atlas Copco

SB hydraulic breaker attachments work in confined spaces and, says Atlas Copco, hit harder and faster than predecessor models. New in the line are the 183-pound SB 100 and 275-pound SB 150 for use on smaller carriers (in the 2,425- to 9,900-pound weight class). Maximum impact frequency is 2,280 bpm. Both breakers operate at a pressure range of 1,450 to 2,175 psi, with the SB 100 requiring an oil flow of 4.2 to 9.2 gpm, and the SB 150 requiring 6.6 to 10.6 gpm.

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Leica

For construction and mining machine operation, the MNS1200 navigation system supports full GNSS signals (L2C and Glonass). It consists of the MNS1200 receiver, the MNA1202GG antenna and the radio modem. The system works around trees, in canyons, mines and sites with overhead obstructions, and is equipped to support future GNSS signals like Galileo and GPS L5. SmartTrack+ technology supplies accurate GPS positions at 20 times per second, says Leica. SmartCheck+ monitoring systems check results immediately and work without interruption.

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Putzmeister

The Water Technology Division of Putzmeister has introduced its new Dynajet 170 Series High Pressure Cleaner, which is designed for a range of applications from paint stripping and rust removal, to surface cleaning, road surface stripping and jet-cutting concrete. Available with various options, the Dynajet 170 Series can be specified with or without covers and can be skid- or trailer-mounted. Its 170-hp Deutz, four-cylinder diesel engine achieves flow rates and pressures from 18.2 gpm at 10,000 psi, to 4.8 gpm at 40,000 psi.

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Shell

Shell Rotella T meets API CJ-4 standards, as well as several OEM requirements, for 2007 diesel engine motor oil. The oil also provides benefits for engines built prior to '07, says Shell. Rotella T will be available in bulk and drums on July 1; and in quart, gallon and pail packages on Oct. 15. CI-4 Plus oils will continue to be available in bulk and drums.

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Parker Hannifin

Parker's all-brass permanent 25 Series Crimp Fittings work with the company's 271 Air Brake Hose. The combination is ideal for tractor-to-trailer lines, axle chamber lines and tractor service lines. Available fitting configurations are male NPTF (01), female SAE 45-degree (08) and adapter-style swivel (7B). The hose has a synthetic rubber inner tube surrounded by one or more layers of fiber braid and synthetic outer cover.

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Kenco

Pipe Lift provides hands-free movement of pipe in a range of widths. No hydraulics are needed. The weight of the pipe causes the lifter to grip the load. The attachment's narrow profile is optimal for working in tight trenches.

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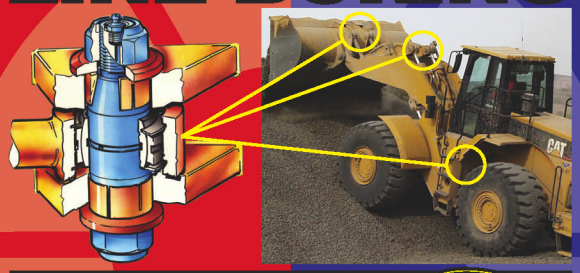

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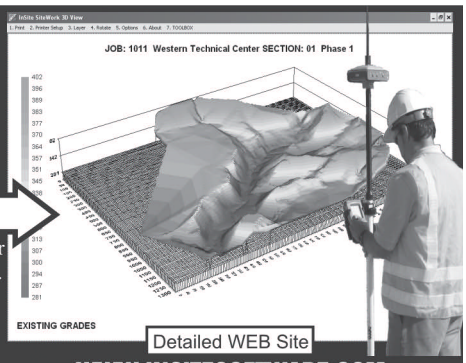

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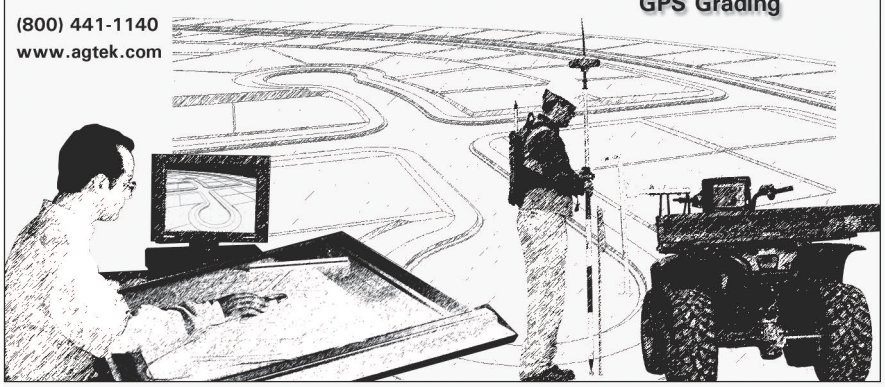

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By KEITH HADDOCK, Contributing Editor

Giant Crawler Tractor

Allis-Chalmers' record-beating HD-41 bulldozer took seven years to bring into production after its launch at the 1963 Chicago Road Show



With a weight of 70 tons and boasting 524 horsepower, the HD-41 crawler tractor made headlines as the largest built up to that time.

Allis-Chalmers gave attendees a taste of things to come at the 1963 Chicago Road Show when it introduced the HD-41 crawler tractor. With a weight of 70 tons and 524 horsepower, the new crawler tractor made headlines as the largest built up to that time. It was only a preview though. Allis-Chalmers wanted to be certain the big dozer would perform exactly how it was intended — be a reliable producer and lower unit cost per cubic yard. So its brief appearance was followed by a lengthy development program with a number of prototypes field-tested in a wide variety of conditions. Customers had to wait until 1970 before it was finally put into full production.

Allis-Chalmers Manufacturing was a major force in big crawler tractors in the 1950s and early 1960s and no stranger to breaking records in the big tractor field. The industrial giant had expanded its tractor division in 1928 when it purchased Monarch Tractor Corp. of Springfield, Illinois. At first Allis-Chalmers marketed the Monarch crawler tractors as its own branded product, but soon re-engineered models began to appear as new technology became available. The 75-drawbar-horsepower Model L gasoline tractor of 1931 was one of the largest crawler tractors built at that time, tipping the scales at 11 tons.

In 1938, Allis-Chalmers started developing its diesel-powered tractor line using General Motors engines. Three models were put in production in 1940 to replace the previous oil tractors; the HD-7, HD-10 and HD-14. The largest of this trio was the most powerful crawler tractor available on the market at that time at 132 drawbar horsepower. This model was also the first crawler tractor to be offered with a torque converter when it was upgraded in 1945. Allis-Chalmers claimed the world size record again in 1947 with the 163-hp HD-19, weighing approximately 25 tons equipped with dozer blade.

The HD-41 tractor came with a Cummins VT-1710-C four-cycle turbocharged diesel and torque converter. Its powershift transmission provided three speeds in either direction for a top forward speed of 6.5 mph. Attachments included bulldozer blades up to 20 feet wide in semi-U and full-U options and a cushioned push block for push-loading scrapers.

In 1974, Fiat S.p.A. of Italy purchased the majority of Allis-Chalmers shares, and the Fiat-Allis joint venture was born. Crawler tractors were continued as Fiat-Allis machines but the "HD" prefix was dropped. The upgraded 41-B model appeared in 1974, and further revisions brought the Fiat-Allis FD-50 with Cummins VT28-C engine in 1982.

Market conditions softened in the 1980s for Fiat-Allis, and the FD-50 was discontinued by 1989 when the company transferred all its earthmoving equipment manufacturing to Italy. The company maintained a sales and parts organization to market imported machines until it was absorbed into CNH Global in 1999.

You can read more about the evolution of construction equipment in Keith Haddock's book, "Giant Earthmovers an Illustrated History" available in most bookstores. Also, consider a membership in the Historical Construction Equipment Association, www.hcea.net. Be sure to visit ConstructionEquipment.com for past Iron Works features.

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SEEING OBSTACLES. MUCH BETTER THAN FEELING THEM. WHEN MORE OF THE WORKSITE IS VISIBLE TO THE DRIVER, OBSTACLES LIKE PALLETS OF BRICKS BECOME LESS MENACING. THAT'S WHY THE GMC TOPKICK HAS BEEN DESIGNED WITH A LARGER WINDSHIELD AND SLOPED HOOD, FOR A BROAD FIELD OF FORWARD VISION. THE DRIVER'S VIEW OF THE GROUND BEGINS AS CLOSE AS 13' FROM THE FRONT BUMPER—HALF THE DISTANCE REQUIRED BY THE FORD F-450/F-550 2WD.* AND FOR EXCELLENT SIDE AND REARWARD VISIBILITY, TOPKICK'S LARGE COWL-MOUNTED MIRRORS ARE A FULL 126 SQUARE INCHES. PLUS, DRIVERS CAN MANEUVER CONFIDENTLY AROUND OBSTACLES. TURNING DIAMETERS ARE AS SHORT AS 38.4',† THANKS TO TOPKICK'S SET BACK FRONT AXLE, COMPACT BBC‡ AND EXCEPTIONALLY TIGHT WHEELCUT ANGLES OF UP TO 53°. **800-GMC-8782 GMC.COM/MEDIUMDUTY**

* Based on comparison of 2006 GMC Topkick C4500/C5500 2WD to 2005 Ford F-450/F-550 2WD.
† Based on C4500/C5500 2WD. ‡ Bumper to back of cab dimension. © 2005 GM Corp.
Vehicle shown with equipment from an independent supplier. See owner's manual for information on alterations and warranties.

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