Reed Business Information

38 Giants ride high on highway funds



68 Pickups that haul some serious loads



76 Is machine technology outpacing techs?



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September 2006
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Graders Take Center Stage

Machines make major design moves in past 24 months

p. 91

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Cover photo supplied by George Pfoertner ©

FEATURES

EXCLUSIVE REPORT: Giants

38 Giants Settle in Astride a Galloping Economy



Giant contractors and materials producers are riding high on highway funds flowing from last year's Transportation Equity Act. According to the *Construction Equipment* Giants survey, it appears as if some of the country's largest equipment-owning firms had a hard time staying in the saddle during the wild ride of 2005. The percentage of Giant contractors that anticipate 2006 will be a very good/excellent business year increased several points to 49. Check out our Giants listings with equipment-replacement values of $100 million or more.

HANDS-ON TRUCKING

68 Monster Pickups Are More Than Toys

Tom Berg reports on the modified Ford SuperDuty F-550 made by Accubuilt, a specialty manufacturer. Engineers have beefed up the basic 8-foot bed with four 19-gauge galvanized steel reinforcers mounted cross-ways under the floor so it can carry payloads up to 11,300 pounds. Berg compares it to other manufacturers' monster pickups.



PREVENTION ILLUSTRATED

72 Seals Save Cylinders

Maintenance programs that quickly repair seal leaks are integral to controlling hydraulic-system repairs and downtime. The reason repairing leaky rod seals is so critical is that as oil leaks out, dust gets in. Abrasive contaminants clinging to the oil film on the rod ride past the leaky seal and head downstream from the cylinder in the hydraulic lines.

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SPECIAL REPORT

76 Equipment Technology Challenges Repair Capability

The Society of Automotive Engineers has established maintainability standards that address such issues as serviceability and repairability of equipment. Some say there is a gap between the engineering and design of machines and the field technicians who have to repair them. Manufacturers speak out about those standards.

HANDS-ON TRUCKING

86 Tundra Double Cab: Not Big Enough?



Toyota will begin producing a larger Tundra, one that's actually a bit bigger than current 1/2-ton full-size competitors (Ford's F-150 and 1500 Series models from General Motors and Dodge, and the Nissan Titan). Tom Berg drove the Double Cab for six days and says it is primarily a personal or family vehicle, but it could double as a tradesman's or landscaper's truck. There's room and seating inside for five big people, and towing capacity is 6,700 pounds for the four-wheel drive model.

BUYING FILE

91 Motor-Grader Technology Hits High Gear



Today's motor-grader market offers more choice and more technically advanced machines than ever before. With Caterpillar's new joystick controls, Volvo's 11-speed transmission, and Komatsu's Laterra Series upgrades (just to name a few), motor-grader manufacturers are investing some serious money in R & D.

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Editorial Staff

Rod Sutton, Editor in Chief
630/288-8130; rsutton@reedbusiness.com

Larry Stewart, Executive Editor
314/962-0639; lstewart@reedbusiness.com

Walt Moore, Senior Editor
630/288-8132; wmoore@reedbusiness.com

Katie Weiler, Managing Editor
630/288-8142; kweiler@reedbusiness.com

Heather Burlingame, Senior Production Editor
630/288-8136; hburlingame@reedbusiness.com

Tom Berg, Truck Editor

Mike Vorster, Contributing Editor

Publishing Offices

Reed Business Information, 2000 Clearwater Dr., Oak Brook, IL 60523; Fax: 630/288-8185

Rick Blesi, Publisher

Dawn Batchelder, Marketing Coordinator

Lisa Hegel, eMedia Coordinator

Bruce Ksiazek, Director of Finance

Karen A. Ruesch, Production Director

Victoria Jones, Production Manager

Allison Ternes, Circulation Manager

Bill Patton, Creative Director

Mary Sondergaard, Art Director

Sales Representatives

Mary Adee, Regional Manager
630/288-8134; Fax: 630/288-8185
madee@reedbusiness.com

Michelle Lorusso, CBC, Regional Manager
770/209-3623; Fax: 630/288-8185
mlorusso@reedbusiness.com

Patricia Maroder, Regional Manager
630/288-8139; Fax: 630/288-8185
pmaroder@reedbusiness.com

Terry McGinnis, Regional Manager
801/273-8790; Fax: 801/273-8799
tmcginnis@reedbusiness.com

Morgan Rautzhan, Account Representative
630/288-8143; Fax: 630/288-8185
morgan.rautzhan@reedbusiness.com

Mike Hancock, International
Quadrant House, The Quadrant,
Sutton, Surrey SM2 5AS, UK
Tel: 011 44 208/652 8248;
Fax: 011 44 208/652 8249

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Responsibility for the Gap

We've racked up more frequent flier miles traveling to new-product introductions this year than any in recent memory. Although home looks much better because of it, the activity has been exciting for folks who like iron as much as this staff does.

Although most machine changes have been predicated by emissions and engine design, two additional trends point to an even greater theme. Design engineers have incorporated notable improvements into cabs and serviceability, giving operator performance greater stature not only in terms of the productivity gained by keeping them comfortable and content, but also in terms of making the machines easier to service.



Rod Sutton, **Editor in Chief**

Many equipment manufacturers spent considerable time with customers in so-called "voice of the customer" sessions, which inevitably included cab comfort and serviceability. Implementing those improvements were as much in response to customer demand as they were designs to improve productivity.

Machine marketers are using the term "maintainability" to describe the ease with which service checks can be made and repairs can be accomplished. In fact, the Society of Automotive Engineers has a standard that manufacturers can use to measure it.

But as we discovered researching this standard, some would say a gap is developing between the level of machine technology and the ability of technicians to keep up with it.

There is little doubt that improper diagnostics result in "no-fault-found" repairs, although there is sufficient debate about the actual percentages of incidents where this happens. Simply put, technicians fix symptoms without addressing the underlying cause.

Training, of course, is an obvious response to this situation. It's incumbent upon end-users to maximize their training dollars and focus on technology whenever possible.

But OEMs and distributors must step up their efforts to communicate new machine technology and enhancements to the end-user. They've designed it, and they understand how it works in conjunction with machine performance. Both equipment managers and suppliers have work to do in order to close the maintainability gap, and both have much to lose if it's not. Scoring high in maintainability doesn't help the machine's user if he or she can't find and fix the problem indicated by an error message.

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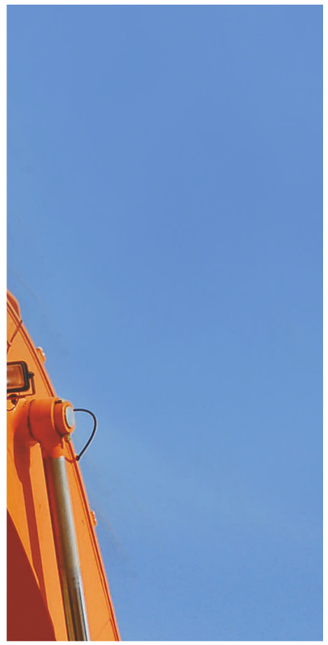

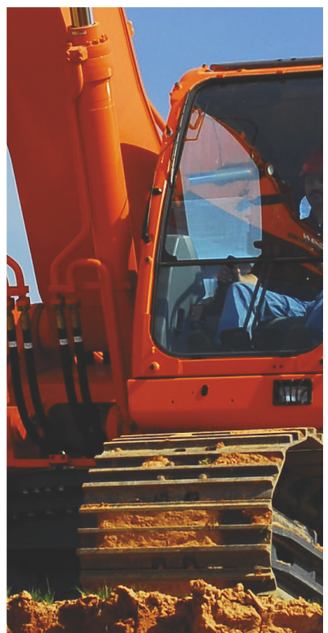

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NEW HOLLAND


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MARKET WATCH

By KATIE WEILER, Managing Editor

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Case

The 420CT and 440CT compact track loaders are rated at 56 and 82 horsepower, respectively. Rated operating capacities for the 420CT are 1,750 pounds at 35 percent tipping load and 2,500 pounds at 50 percent; for the 440CT, 2,100 pounds at 35 percent and 3,000 at 50 percent. The 420CT has 5.2 psi ground pressure with 12.7-inch-wide tracks; the 440CT has 5 psi ground pressure with 15.7-inch tracks.

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Bobcat



The new four-wheel-drive Bobcat 2300 utility vehicle can be equipped with the company's RapidLink attachment system, which is hydraulically actuated and can accommodate a bucket, mower, pallet forks, snow blade and whisker push broom. The RapidLink attachment arm can lift loads up to 500 pounds as high as 2 feet, and when not required, the system can be removed for conventional operation of the vehicle. The 2300 features a 20-hp diesel engine, as well as the Bobcat IntelliTrak drive system. It can haul 800 pounds in its power-dump cargo box.

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Bomag

BM1000/30 and BM1300/30 cold planer milling machines have centrally mounted cutting drums for milling next to walls, curbs and other obstructions. Standard cutting width is 39.6 inches and 51.4 inches, respectively, and both can cut to 12.6 inches deep. Both are powered by 275-hp Caterpillar diesels. Direct mechanical drive of the cutting drum provides maximum power transfer, the company says.

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Caterpillar

IT38G Series II Integrated toolcarrier has been redesigned to provide optimal line of sight to the quick coupler and work tools and to increase the number of work tools available to the machine. The bucket sizes now available range from 2.75 to 3.5 cubic yards as compared to the previous offering of 3 to 3.5 cubic yards. The 180-net-hp machine features parallel lift linkages and integral quick couplers.

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Market Watch



Case

The 1150K crawler dozer has a hydrostatic transmission, redesigned cab and low-effort electronic blade control. A 6.7-liter Case Family IV engine provides power and is rated at 118 horsepower. Weights range from 27,858 to 29,365 pounds, depending on machine. Case Extended Life Track undercarriage provides up to twice the life of lubricated tracks.

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Morbark

The 4600XL Wood Hog has a hammermill that is 14 percent larger than that of its predecessor model, and it has horsepower options to up to 860. It has 18 hammers that provide aggressive, multi-purpose grinding, says Morbark, and it uses an internal, planetary-drive feed wheel with no chains or sprockets. It also features Morbark's Iqan System, which is aimed at boosting production by providing a consistent feed.

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John Deere

AutoLoad is an automatic scraper control system available on pull-type scrapers. It adjusts the cutting edge height according to draft loads, wheel slippage and soil conditions, without operator intervention. At the end of the cut, activation of the selective control valve lever disengages the system.

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Schwing

KVM 32XL and 34X truck-mounted concrete boom pumps have added Generation III 2025-5 pump kits as standard. The pump has 10-inch material cylinders, 79-inch stroke, and twin circuit hydraulics. With the new kits, concrete pumps deliver 178 cubic yards per hour at 23 strokes per minute.

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Terex Crushing & Screening

With an assembly time of about 20 minutes, the Powerscreen Warrior Radial is designed for dry screening, three-way splitting and stockpiling a variety of materials. Operators can hydraulically raise and lower the screen box for maintenance access, and bolt in screens and wires of various sizes. With the side conveyor removed, the unit converts to a two-way split machine.

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Case



E Series compact wheel loaders feature a new Versa-Boom linkage, introduced on the first three models: 21E, 221E and 321E. The loader linkage is of new design that the company says offers visibility, precise parallel lift, increased bucket roll back, and a 10 percent increase in reach. High-torque, four-cylinder Deutz diesels power the series, providing 52, 59 and 72 horsepower, respectively.

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Hydrema

The 922C articulated hauler has a Tier-3, 6.7-liter Cummins diesel engine, which develops 274 horsepower at 2,000 rpm, and has peak torque in the range of 1,300 to 1,500 rpm. The truck weighs 75,680 pounds and can handle a 44,000-pound payload.

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Caterpillar

The 500-Series 511, 521, 522 and 532 track feller bunchers and harvesters feature zero tail swing and C9 ACERT engine. Horsepower ranges from 247 to 284; weight, from 53,710 to 69,710 pounds. In feller-buncher configuration, bare pin lift is 15,600 pounds at 20 feet. In harvester configuration, bare pin lift is 9,100 pounds at 29.5 feet.

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Market Watch

Caterpillar



The 541, 551 and 552 track feller bunchers and track harvesters feature a 305-gross-hp C9 ACERT engine. The 552 has a 3-cylinder leveling mechanism that provides simultaneous tilting forward and side-to-side. According to Cat, the machines have industry-leading lift capacities. In feller-buncher configuration, bare pin lift is 21,800 pounds at 21.5 feet. In harvester configuration, bare pin lift is 9,500 pounds at 35 feet.

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Wirtgen

WR2400 soil stabilizer and reclaimer has a working width of 94.5 inches, and the machine can mill and recycle to a depth of 20 inches. Its 563-hp powerplant provides high reserve capacities for treatment of difficult soils, according to the company. All-wheel drive and high ground clearance, due to its vertical lifting column design, helps prevent the machine from becoming stuck. Four steering modes are available.



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Case

The 1850K Series 3 crawler dozer is Tier III compliant. A six-cylinder, 6.7-liter Case Family IV diesel provides 184 horsepower on the long track and extra-long track versions and 199 horsepower on the low ground pressure configuration. The 1850K has 702 pounds-feet of torque and 126 inches of track on the ground. Electro Hydraulic Controls give the operator a single joystick lever for control.

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Link-Belt

TCC-450 telescopic crawler crane was built in partnership with Hitachi Sumitomo Construction Crane and offers the capability of an RT crane with the mobility of a crawler, the company says. The 45-ton machine is a derivative of HSC's model introduced last year.

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Ingersoll Rand

Titan 7820 paver places any kind of wearing, binder and base course material, including roller-compacted concrete, cement-treated base, stone and asphalt. Hopper capacity is 14.8 tons, and a 231-hp Duetz diesel gives the paver variable speed control up to 65 fpm when paving. Various screeds can be used to pave up to 38.2 feet wide, 11.8 inches thick.

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Terex

The TXC 300LC-2 excavator replaces the TXC 300LC-1 and has a new pattern-change control. Oil-change intervals have been stretched to 4,000 hours, air-filter replacement to 2,000 hours, and front pin lube intervals to 250 hours. Tier III-compliant diesel partners with the company's e-EPOS management system to increase productivity by 4 percent and fuel efficiency by 6 percent. It also features a roomier cab with 20 percent more cooling capacity and 8 percent more air flow.

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ENGINE NEWS

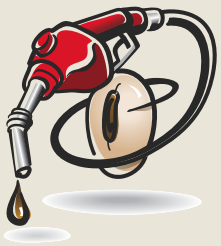
Case Approves Biodiesel

Case has become the first construction-equipment manufacturer to approve the use of B5 blends (5 percent biodiesel and 95 percent petroleum-based diesel) in all of its mechanical engines. The global manufacturer also approved use of B20 blends (20 percent biodiesel mixtures) in all Case engines other than electronic engines and those in the Case 410 and 420 skid-steer loaders.

Testing on electronic engines is not yet complete, but Case is expected to approve use of B20 in them. The 410 and 420 skid-steers use engines provided by ISM, which has not yet approved use of B20.

Biodiesel is produced from vegetable-based oils derived from renewable resources such as soybeans and canola. It is lauded as an important alternative to dependence on imported oil.

"Case is committed to working with its partners to push toward higher-level biodiesel blends that will be compatible with future low-emissions-compliant



engines," says Jim McCullough, president of Case Construction Equipment. "We've initiated aggressive field tests to evaluate the performance of Case engines with 100 percent biodiesel."

Most diesel burned in Europe is already B5, and fuel sources on the continent are moving swiftly toward B20.

"Biodiesel has slightly less energy content so you get a little less power, but the difference is not perceptible to the operator, says Rick Hall, vice president of construction equipment engineering at Case. "All of our tests with B20 have shown a very small difference – if you measure power out to three decimal places, you might see it."

Biodiesel has some solvent-like characteristics, so it can actually clean up fuel injection systems. There is a remote threat of fuel-system leakage, but seals used in injection systems since the first reduction in diesel-fuel sulfur are compatible with biodiesel.

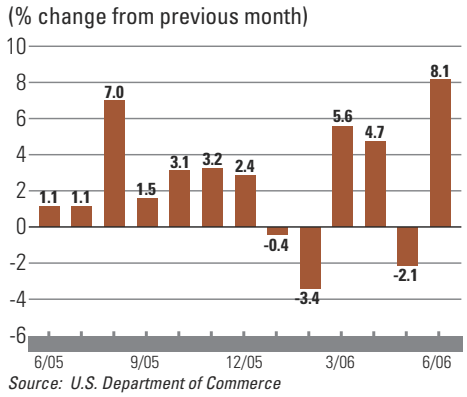
New Holland's agricultural-equipment business unit, another brand owned by Case's parent CNH, also announced its approval of B20 blends in New Holland engines powering its ag equipment.

Owners should see their local Case or New Holland dealer for more information on specific biodiesel applications.

MANUFACTURER NEWS

Cummins To Build Light Diesels

Cummins entered a joint venture with a major auto manufacturer to develop and manufacture light-duty diesel engines for various vehicles smaller than 8,500 pounds gross vehicle weight, including standard pickup trucks and sport utility vehicles. Certain bus, marine and industrial applications also will be served by the engine family. The first vehicles with this engine are expected to be ready for market by the end of the decade. Cummins expects the diesel engine to use an average of 30 percent less fuel than gasoline engines for comparable vehicles. The concept for this product is the result of a nine-year partnership between Cummins and the U. S. Department of Energy.



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STATUS & FORECAST

↑ Manufacturing Construction Spending

Spending jumped 8.1 percent in June to nearly double the low point in the last recession. The chemical, food, electronic and nonmetallic minerals industries have boosted facility investment, while spending for transportation equipment factories has increased little. The near-50-percent drop in the value of construction starts in the first half means that little further expansion is expected. Visit ConstructionEquipment.com for more economic information.

MANUFACTURER NEWS

Titan Buys Continental's Off-Road Tire Plant

Titan Tire acquired Continental Tire North America's off-the-road tire facility in Bryan, OH, late in July for $53 million. Continental's CEO, Manfred Wennemer, confirms, "the sale of our Bryan facility is part of our overall strategy to focus on passenger and light-truck and commercial-vehicle tire manufacturing."

The Ohio facility employs approximately 325 people, and it posted $125 million in sales in 2005.

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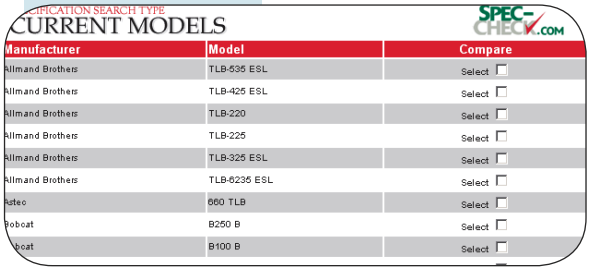

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Read information on maintaining and managing fleets, as well as magazine archives, in the horizontal-navigation bar.



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— Joe Schuster, Equipment Manager, Emery Sapp & Sons, Inc.

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With GlobalTRACS installed, Joe and his team could immediately see the "big picture" on their entire fleet – where each piece was located, how much it was being used, and whether it needed service.

Before GlobalTRACS, this data had to be captured manually. But the records were incomplete, and sometimes maintenance crews couldn't even locate equipment they were supposed to service.

"We've now set up a much more effective preventive maintenance program at 250-hour intervals," Joe says. "We're seeing big improvements in uptime and equipment performance."

There are also improvements on the production side.

"GlobalTRACS helps us make better decisions about where to send equipment, so we're saving money on rentals," he says. "Plus, GlobalTRACS' geo-fencing capability helps keep equipment secure around the clock."

Joe really likes how GlobalTRACS performs on the balance sheet. "The system will pay for itself very quickly in terms of the money we're saving.

"What can I say? GlobalTRACS just makes my job a whole lot easier."



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Digest

APPLICATION IDEAS

Hot Tires Stop Pavement Pickup

One of the most persistent problems with using pneumatic rollers to compact asphalt, especially at today's high rolling speeds, is the asphalt's tendency to stick to the rubber tires.



Some manufacturers are making heat-retaining skirts standard equipment on pneumatic rollers to discourage asphalt pickup.

Contractors who use rubber-tired rollers find they have to adapt to changing mixtures with different release agents to solve what becomes a severe pickup problem on mats of polymer-modified asphalt. But on unmodified asphalt, consulting engineer Jim Scherocman says the solution can be simple.

"Few contractors take the time to warm up tires prior to putting the roller on the hot mat," Scherocman says.

He strongly suggests driving the roller back and forth on an established pavement for about 15 minutes before going to work to bring tires up to operating temperature, and discourages spraying water on the tires, which tends to cool them. He also recommends maintaining tire heat during the day.

"If you find yourself waiting for trucks to arrive, don't shut the pneumatic roller down because the tires will cool," Scherocman says. "Keep it moving. Tire deflection will keep the tires warm."



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By LARRY STEWART, Executive Editor

Giants Settle in Astride



Construction Equipment surveys firms with fleet-replacement values of $25 million or more each year to gauge their business outlook and fleet-management intentions. The Giants list includes construction firms, materials producers, rental companies, industrial companies, government agencies, and other owners of mixed fleets of mobile diesel equipment. Contractors make up 47 percent of the full Giants list.

The economy is strong and Giant contractors and materials producers are riding high on highway funds flowing from last year's Transportation Equity Act. According to the ***Construction Equipment*** Giants survey, it appears as if some of the country's largest equipment-owning firms had a hard time staying in the saddle during the wild ride of 2005.

Business seemed almost too good last year, particularly for rental, contractor and materials-producer Giants. Firms working those vocations were coming off of three years of very

Dulles Airport expansion project, Dulles, VA

Source: Sunbelt Rentals

a Galloping Economy

Contractors' confidence stabilizes the slide as rental and mining firms' exuberance slows to sustainable enthusiasm

strong work-volume growth. Last year, tremendous percentages of them forecast increases in work volume — the most ever for rental and contractor Giants. Respondents to the Giants survey early this year indicated that even more firms increased work volume in 2005 than anticipated — all of the rental firms, 74 percent of contractors, and 61 percent of materials producers.

Contractors' 2006 work-volume forecasts have moderated compared to last year's juggernaut, but if they remain true to their historical accuracy, the percentage of Giant contractors that logs actual work-volume increases this year will be greater than in any year from 2004 back to 2000.

The percentage of Giant contractors that anticipate 2006 will be a very good or excellent business year increased several points to 49, marking the third year above 40 percent for this indicator of bountiful business. In a similar way, the percentage of contractors increasing spending on replacement equipment has grown through the mid 40s over the past three years.

Materials producers don't have the same track record for work-volume prediction. In 2005, 14 percent of them underforecast work volume. Perhaps as a result of this pleasant surprise, a remarkable 67 percent of materials Giants expect work volume to increase again this year — second only to the rental firms on the Giants list.

Fifty-five percent of materials firms plan to spend more on equipment this year than last — a number that equals rental Giants' expectations. And 56 percent of materials producers expect 2006 to be a very good or excellent business year.

About 17 percent of mining Giants didn't achieve their projections for work-volume growth last year, but it's clear that their workload leveled off at a profitable point. Even though the percentage of miners expecting a very good or excellent business year dropped by 18 percent, the 58 percent expecting a big year is second only to rental firms among Giant vocations. Giant mines' fleet buying should remain on the rise, as half of them expect to spend more on equipment this year.

The contrasts in rental Giants' 2006 business outlooks and plans could prove to be an example of business being too good. Ninety-four percent of rental Giants expected very good to excellent business in 2005. All of them saw work volume increase last year, and 91 percent expect work volume to grow again this year. It's the most positive forecast among Giant vocations, and supports 64 percent of rental firms that expect very good or excellent business this year. Nonetheless, the percentage of Giant rental firms with great business expectations plunged 30 percentage points compared to the 2005 outlook.

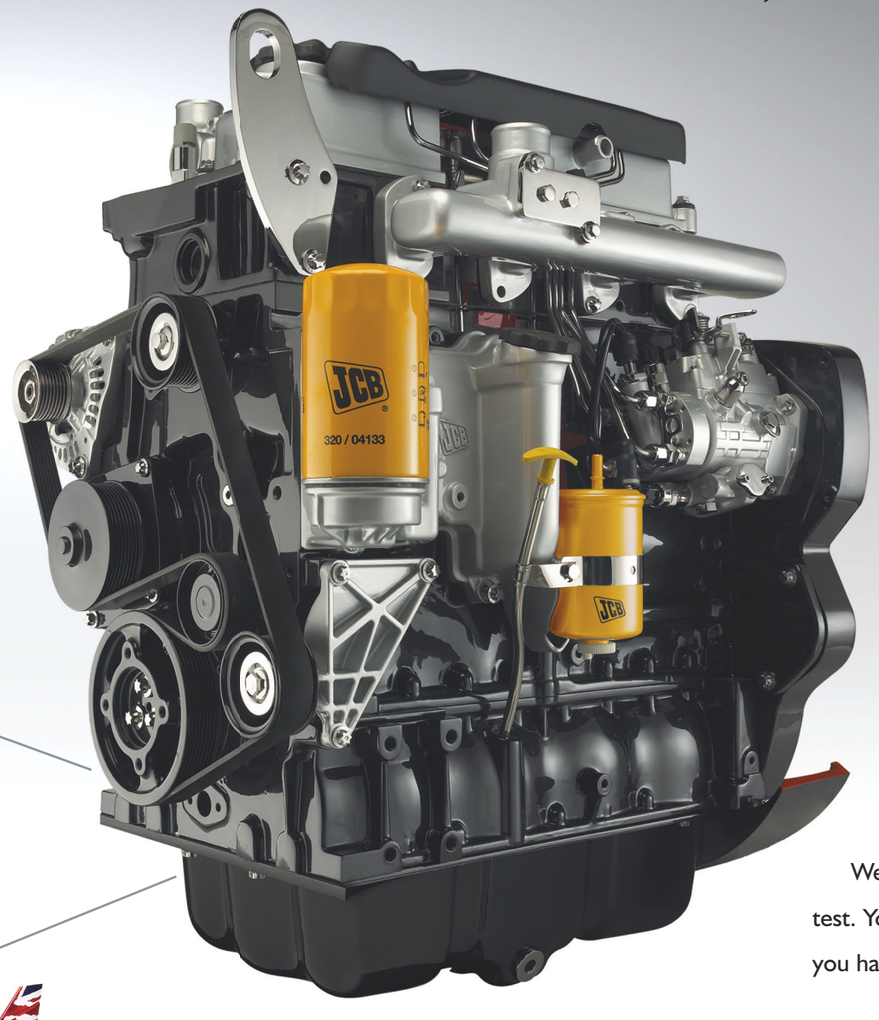
Extreme work volume growth for three years inspired 88 and 91 percent of rental Giants to increased spending on replacement equipment in 2004 and 2005. With little let-up in demand expected, only 55 percent of rental Giants plan to increase fleet spending this year. That forecast is tied with materials Giants for the lead in equipment-spending growth plans, but it is 36 points below last year's level.

Utility companies with Giant fleets have the only really damp outlook on 2006. Five percent of utilities were expecting work volume to rise last year, but instead found work holding pace with 2004. None expect business

WORLD DIESEL ENGINE SPEED RECORD–350 MPH

AUGUST 2006, BONNEVILLE SALT FLATS, UTAH





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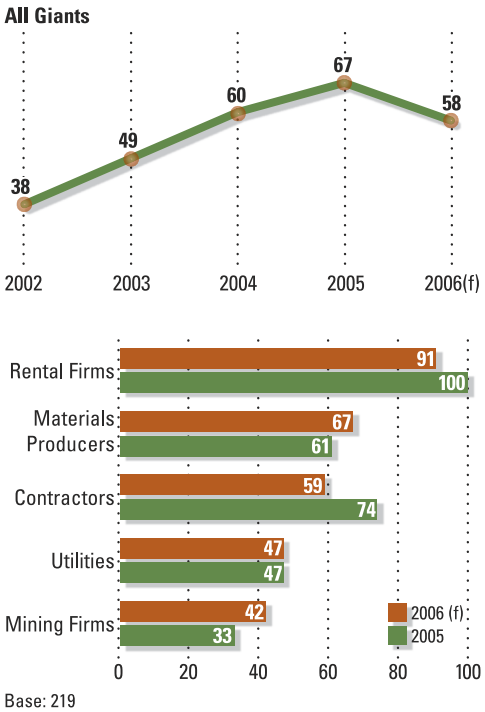
to be very good or excellent this year.

With expectations for business quality drooping but favorable, some business sectors are ripe for mergers and acquisitions. Some Giant contractors are trading on recent success to add market share and build bidding strength. Parsons, for example, bought RCI Construction Group, the largest minority-owned business in Washington, last year. Giant vocations such as rental, mining and materials that are more sensitive to mixed signals in today's economic tea leaves (slowing housing starts and 17 prime-interest-rate hikes combating inflationary energy and raw-material costs) are awash in acquisition activity.

Six of the seven largest rental fleets are openly involved in some kind of acquisition. Ashtead, European parent to Giant rental com-

Work Volume Growth to Slow

Percent of Giants reporting increased work volume



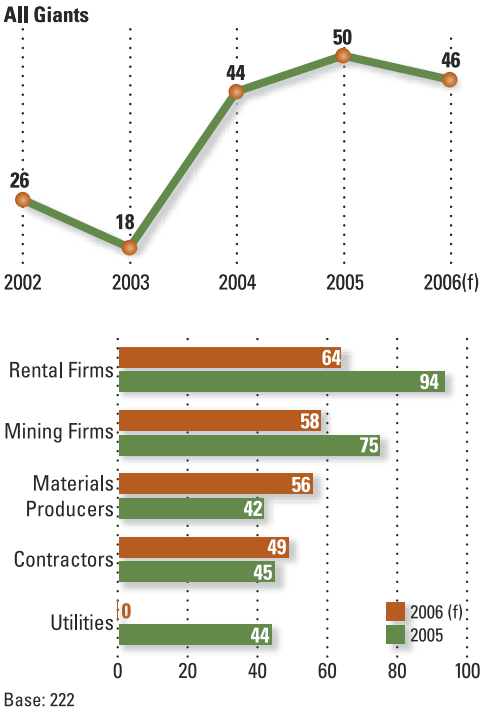
Base: 219

Source: Construction Equipment *Giants Studies*

In 2005, more Giants saw their work volume increase (67 percent) than in 10 years, so it should be no great cause for alarm that the percentage of firms expecting more work in 2006 is down somewhat. Fifty-eight percent of Giants forecast increased work volume this year — the most since 1999. Nearly 30 percent of Giant contractors expect their workload to maintain 2005's pace.

Exuberance Softens to Enthusiasm

Percent of Giants forecasting an excellent or very good business year



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Source: Construction Equipment *Giants Studies*

Percentage of Giants forecasting booming business this year dropped four points but remains strong — better than 2004 and any previous year back to 2000. Only 12 percent of firms forecast a fair or poor business year, marking a four-year slide for that ominous measure. Hopes of Giant materials producers are inspired by unexpected increases in 2005 work volume.



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*Compared with our conventional model

pany Sunbelt, bought NationsRent in August. An investment group called Diamond Castle Holdings bought NES earlier in the year, and H&E Equipment paid nearly $60 million for California's Eagle High Lift. Atlas Copco expects to close the sale of its rental subsidiary RSC within a couple of months, and the newly independent Hertz Corp. could find a buyer for its equipment rental company (HERC). Maxim Crane Works recently hired Goldman Sachs to "explore strategic alternatives," including merger or sale of the country's most valuable crane fleet.

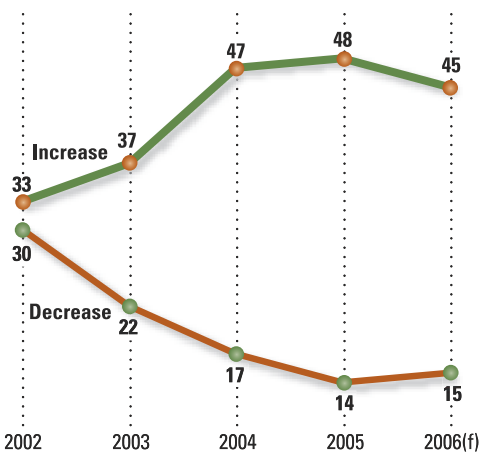
Mining titan, Barrick Gold, bought competitor Placer Dome to become the world's largest gold miner. Phelps Dodge is trying to buy Inco, which was unable to close a deal to buy Falconbridge. Teck Cominco is competing with Phelps Dodge for Inco, and Xstrata is now attempting to buy Falconbridge.

Ashland is negotiating the sale of its APAC paving subsidiary to Irish materials-company consolidator OldCastle, and the Aggregate Industries subsidiary of Holcim US bought The Meyer Co. last year.

It's shaping up as a year of change for Giants. Some super-heated businesses — rental and mining firms in particular — are cooling to manageable levels. Others — contractors and materials Giants, for instance — seem to be just reaching a temperature where they can really cook.

Fleet Spending Steady

Percent of Giants expecting the change in new-equipment spending

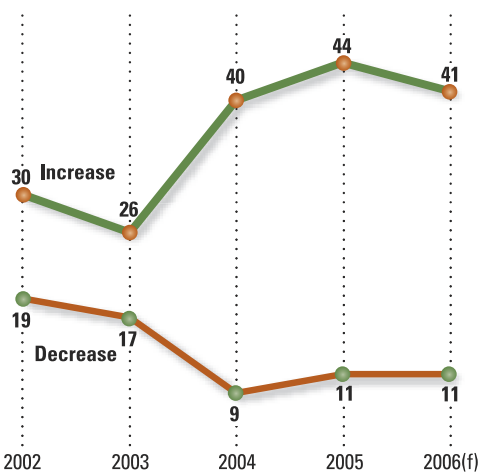


Base: 220
Source: Construction Equipment *Giants Studies*

The percentage of Giant firms that actually increased spending on new equipment has grown since 2002. Giants tend to forecast fleet spending accurately, if a little conservatively, so it seems likely that fleet growth will continue at similar rates. Forty percent of Giants expect to spend about as much as last year.

Rental Still Climbing

Percent forecasting the change in rental use



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Source: Construction Equipment *Giants Studies*

The portion of Giants anticipating increased rental spending this year (41 percent) is the highest it has been since 1993, and Giants have under-forecast rental use every year since 1995. Only 32 percent of Giants forecast more renting in 2005, but 44 percent of responses to this year's survey recorded actual increases last year.



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By LARRY STEWART, Executive Editor

Giants 2006

Rank	Company	Equipment Replacement Value ($ in millions)	Comments
1	**United Rentals,** Greenwich, CT	$4,000	Purchased Carter Rental in Valdosta, GA; annual revs $10 million
2	**U.S. Army Engineers,** Ft. Leonard Wood, MO	$3,267	Worldwide fleet of construction and support equipment
3	**Martin Marietta Aggregates,** Raleigh, NC	$3,024*	Invested $56 million to improve plant productivity in 2006's record Q2
4	**Lafarge North America,** Reston, VA	$2,638*	Acquired Ritchie Cos. in Wichita in November 2005
5	**Hanson North America,** Neptune, NJ	$2,420*	Acquired 13th largest aggregate producer in U.S., Materials Service Corp.
6	**Sunbelt/NationsRent,** Charlotte, NC	$2,200	Parent, Ashtead, is buying NationsRent; forming rental's new No. 3
7	**Inco,** Toronto, ON	$2,093*	Trying to merge with Phelps Dodge; become 2nd largest nickel producer
8	**Hertz Equipment Rental (HERC),** Park Ridge, NJ	$2,075*	Investors that bought Hertz are taking the company public
9	**Peter Kiewit Sons,** Omaha, NE	$1,900	Stockton, CA, precast yard will cast 878 panels for Oakland Bay Skyway deck
10	**Vulcan Materials,** Birmingham, AL	$1,892*	Raising capacity of Sac Tun quarry on Yucatan from 9 to 12 million tons
11	**GE Energy,** Stamford, CT	$1,736*	Provides power-plant clients with construction ability
12	**RSC Equipment Rental,** Houston, TX	$1,696*	Atlas Copco expects to close sale of RSC in Q3 2006
13	**Cemex North America,** Monterrey, NL	$1,508*	Adding a second kiln at Balcones Cement Plant in New Braunfels, TX
14	**Phelps Dodge Mining,** Phoenix, AZ	$1,430	Plans to best Teck Cominco's offer to buy Inco
15	**APAC,** Russell, KY	$1,400	Parent, Ashland, is negotiating sale of paving subsidiary to OldCastle
16	**Arch Coal,** St. Louis, MO	$1,300	Income from Q1 2006 operations ($94.1 million) tripled previous year's
17	**BNSF Railway,** Fort Worth, TX	$1,250	Q2 2006 freight revs up 18 percent, or $549 million, over 2005
18	**MDU Resources,** Bismarck, ND	$1,200	Acquired Cascade Natural Gas in WA and OR

* Equipment-replacement values are compiled by *Construction Equipment* magazine using information provided by the individual companies. When figures were not provided (identified with an asterisk), *Construction Equipment* estimated fleet value. The *Construction Equipment* Giants list (a portion of which is published here) represents as closely as possible all firms that own fleets with replacement values of $25 million or more. This list is also available at ConstructionEquipment.com. If you feel your firm qualifies as a Giant, please write to Larry Stewart, *Construction Equipment*, at lstewart@reedbusiness.com or phone 314-962-0639.

Rank	Company	Equipment Replacement Value ($ in millions)	Comments
19	**Kennecott Services,** Salt Lake City, UT	$1,151*	Investing $170 million to stretch Bingham Canyon Mine's life to 2017
20	**Marathon Oil,** Houston, TX	$1,100*	Acquired leases in Colorado Piceance Basin, adding 900 bcf of natural gas
21	**BHP Billiton,** San Francisco, CA	$1,085*	Developing Shenzi field in Gulf of Mexico and Canada's EKATI diamond
22	**Great Lakes Dredge & Dock,** Oak Brook, IL	$1,000	Rock dredging is a specialty of this dredging contractor
23	**Drummond Co.,** Jasper, AL	$980	Ranks in the top 25 percent of U.S.-owned coal companies
24	**Oldcastle Materials,** Washington, D.C.	$925	Largest U.S. asphalt producer; attempting to buy APAC
25	**Newmont Mining,** Denver, CO	$900*	About 38% of sales and gold reserves are in North America
26	**North Carolina DOT,** Raleigh, NC	$900	State road maintenance
27	**Granite Construction,** Watsonville, CA	$800	Will take $87 million of a $347.9 million bridge JV near Baton Rouge
28	**NES Rentals,** Chicago, IL	$800	Sold for $850 million to private equity firm Diamond Castle Holdings
29	**Maxim Crane Works,** Pittsburgh, PA	$744*	Hired Goldman Sachs to "explore strategic alternatives" including sale
30	**Peabody Energy,** St. Louis, MO	$737*	World's largest coal company
31	**Aggregate Industries,** Bethesda, MD	$697*	Acquired Meyer Material near Chicago for $231 million in June
32	**Texas DOT,** Austin, TX	$650	State road maintenance
33	**Waste Management,** Houston, TX	$650	Enviro-services giant converted 495 vehicles from diesel to natural gas
34	**H & E Equipment Services,** Baton Rouge, LA	$600*	Bought Southern California's Eagle High Reach for $59.9 million
35	**Cleveland-Cliffs,** Cleveland, MI	$561*	Largest producer of iron ore pellets in North America
36	**Virginia DOT,** Suffolk, VA	$534	Highway department maintains 10,000 pieces of rolling stock
37	**Syar Industries,** Napa, CA	$520	Materials producer operates seven quarries in California
38	**Florida Rock Industries,** Jacksonville, FL	$505	Record net income of $58.3 million in Q3 2006 is 27% better than 2005
39	**North American Coal,** Dallas, TX	$504*	Top 10 U.S. coal producer mines about 35 million tons per year
40	**FirstEnergy,** Akron, OH	$500	Diversified energy firm owns 7 electric utilities serving OH, PA and NJ
41	**Grupo Mexico,** Colonia Roma Sur, DF	$500*	World's third largest copper producer, owns ASARCO
42	**International Mill Service,** Horsham, PA	$500	Slag processing subsidiary of Envirosource Inc; 51 sites
43	**Modern Continental Construction,** Cambridge, MA	$500	Working five contracts in Cambridge worth total of $34.1 million
44	**Pennsylvania DOT,** Harrisburg, PA	$500	State highway maintenance
45	**Qwest,** Englewood, CO	$500	Macro Capacity fiber optic network spans 190,000 miles globally
46	**Weyerhaeuser,** Federal Way, WA	$500*	Reported 2005 earnings of $733 million, down from $1.3 billion in 2004
47	**Syncrude Canada Ltd.,** Ft. McMurray, AB	$489	Canadian Oil Sands acquired Canada Southern Petroleum in June 2006

* *Construction Equipment* estimate



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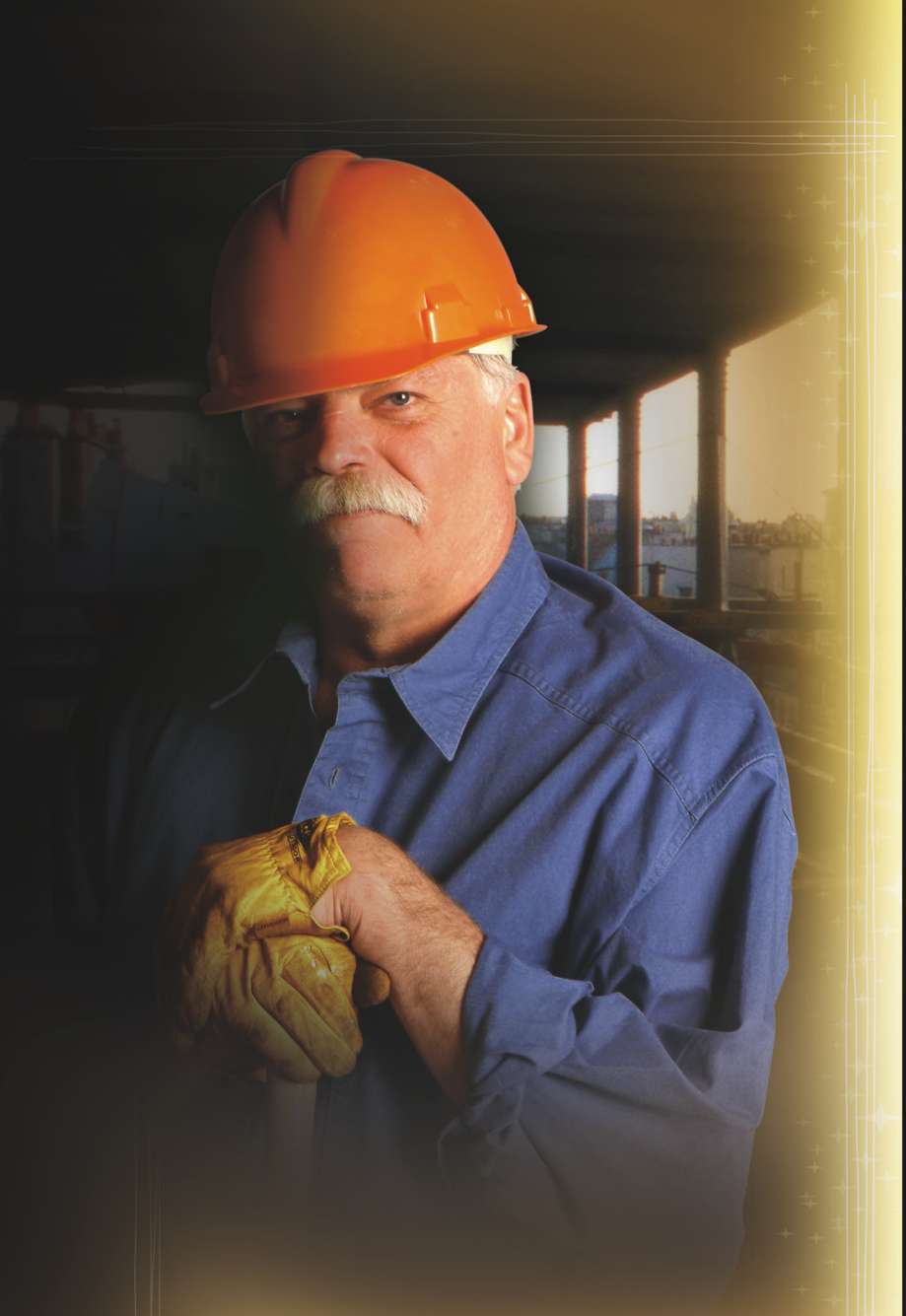
Rank	Company	Equipment Replacement Value ($ in millions)	Comments
48	**Southern Company,** Atlanta, GA	$466*	Operates Alabama, Georgia, Gulf, and Mississippi Power; Savannah Electric
49	**Elmo Greer & Sons,** London, KY	$465*	Uses DTSystems dispatching system
50	**Exelon,** Chicago, IL	$462*	Merger with PSEG expected to close in third quarter
51	**Pittsburg & Midway Coal,** Englewood, CO	$460	Subsidiary of Chevron operating five mines
52	**All Erection & Crane Rental,** Cleveland, OH	$457*	Largest privately owned crane firm in North America; 25 locations
53	**Verizon Communications,** New York, NY	$450*	One of the 10 largest U.S. commercial fleets; Giants value excludes autos
54	**Georgia Pacific,** Atlanta, GA	$431*	Bought Insulair, maker of paper cups and lids, for $170 million
55	**Aggreko North America,** New Iberia, LA	$428*	Focused on renting power, temperature control and oil-free compressed air
56	**Neff Rental,** Miami, FL	$420	In 2005 Odyssey Investment acquired for about $510 million
57	**Clark Construction,** Bethesda, MD	$400	Started Phase 1 of Houston's Hobby Airport expansion in June 2006
58	**Freeport Indonesia,** New Orleans, LA	$400	Precious-metals miner (mostly copper) operates mine in Irian Jaya, Indonesia
59	**Teck Cominco,** Vancouver, BC	$376*	Trying to get in front of Phelps Dodge with a hostile takeover of Inco
60	**AMECO (American Equipment Co.),** Greenvillle, SC	$375	Supplying most equipment to build Mexico's El Cajon hydroelectric dam
61	**United Contractors Midwest,** Springfield, IL	$365	Two years into $172-million reconstruction of I-74 thru Peoria
62	**Las Vegas Paving,** Las Vegas, NV	$356	Produced and laid 1 million tons of asphalt each year since 1992
63	**Barrick Gold,** Toronto, ON	$355*	Acquired Placer Dome; became world's leading gold company with 27 mines
64	**Bechtel,** Louisville, KY	$350	Motiva hired Bechtel/Jacobs JV to expand refinery at Port Arthur, TX
65	**Essex Crane Rental,** Buffalo Grove, IL	$350*	Operates rental fleet of over 420 lattice-boom crawler cranes, up to 300 tons
66	**The Vecellio Group,** West Palm Beach, FL	$350	Bought Sharpe Bros. and organized all NC asphalt work under Sharpe name
67	**North American Energy Partners,** Spruce Grove, AB	$343	Started up Hitachi EX8000 shovel/maintenance facility at CNRL's Horizon Mine
68	**Allied Waste Industries,** Scottsdale, AZ	$340	Operates 163 transfer stations, 169 landfills, 57 recycling facilities in 37 states
69	**Safety-Kleen,** Columbia, SC	$340	Operates more than 200 collection and processing facilities in North America
70	**Consolidated Edison,** New York, NY	$330*	Energy company will invest $5.3 billion in infrastructure over three years
71	**T.J. Lambrecht Construction,** Joliet, IL	$328	Highway-and-heavy firm operates over 800 pieces of heavy equipment
72	**International Coal Group,** Ashland, KY	$325*	Organized by W.L. Ross & Co. to acquire bankrupt Horizon Natural Resources
73	**Weeks Marine,** Cranford, NJ	$325	Value includes Healy Tibbitts Builders, of Hawaii
74	**Ahern Rentals,** Las Vegas, NV	$325*	U.S.' largest privately owned rental business operates 3,100 units
75	**Clyde Companies,** Orem, UT	$324	$90 million contract to rebuild 12300 South interchange on I-15 in Utah
76	**RJM Construction,** Las Vegas, NV	$315	Mining contractor

* *Construction Equipment* estimate



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Rank	Company	Equipment Replacement Value ($ in millions)	Comments
77	**Los Angeles Dept. of Water & Power,** Los Angeles	$305	Nation's largest municipal utility
78	**Falconbridge,** Toronto, ON	$304*	Xstrata working to buy Falconbridge in the wake of Inco's failed attempt
79	**A & A Ready Mixed Concrete,** Newport Beach, CA	$300	26 locations serve CA; specialize in portable batch plants
80	**Pike Electric,** Mt Airy, NC	$300*	Overhead/underground powerline work in 19 states with fleet of 2,000 units
81	**Skanska USA,** Greenwich, CT	$300*	Awarded $199 million contract to rebuild section of I-95 in south Georgia
82	**Teichert,** Sacramento, CA	$300	250 Class 8 trucks, in addition to a highway-and-heavy-construction fleet
83	**Willbros Group,** Houston, TX	$300	Pipeline contracts include 750 miles of Overland Pass; 106 miles of Guardian
84	**Suncor Energy,** Calgary, AB	$286*	Oil-sands producer of raw material for light crude, diesel fuel, custom blends
85	**The Lane Construction Corp.,** Meriden, CT	$282	Two contracts rebuilding SR 408 Toll Road in Orlando total $186 million
86	**New York DOT,** Albany, NY	$275	State highway department
87	**Dominion Resources Services,** Richmond, VA	$270	Power and gas utility
88	**Flatiron Construction,** Longmont, CO	$260*	In a JV constructing $348M cable-stayed Mississippi River crossing in LA
89	**Carmeuse North America,** Pittsburgh, PA	$250*	Stopped producing lime in Hanover, PA, but lime will be processed there
90	**CONSOL Energy,** Pittsburgh, PA	$250	Mines more high-btu bituminous coal than any other U.S. producer
91	**Dycom Industries,** Palm Beach Gardens, FL	$250	Acquisition of Prince Telecom Holdings brings family of subsidiaries to 28
92	**Florida Power & Light,** Miami, FL	$250	Utility plans new transmission lines for Miami-Dade/Manatee-Sarasota Cts.
93	**Manson Construction,** Seattle, WA	$250	Wrapping up construction of $14.8 million Port of Everett Rail/Barge Facility
94	**McAninch,** Des Moines, IA	$250	Iowa's largest earthmover/utility contractor; fleet of 400 Cats
95	**South Carolina DOT,** Columbia, SC	$250	State road maintenance
96	**Tennessee DOT,** Nashville, TN	$250	State road maintenance
97	**Canada Building Materials,** Toronto, ON	$249	Over 450 ready-mix trucks operate out of 40 plants
98	**Edward Kraemer & Sons,** Plain, WI	$249*	Spun off Kraemer Materials in July; sold E80 Plus Constructors in May
99	**Balfour Beatty,** Novi, MI	$248*	New road contracts in OH and PA total more than $200 million
100	**The Walsh Group,** Chicago, IL	$247	Hometown contractor picked to build Chicago's 2,000-foot Fordham Spire
101	**Sunstate Equipment,** Phoenix, AZ	$243	Renting for 25 years; now has locations in 8 Southwestern states
102	**Prairie Group,** Bridgeview, IL	$240	Materials producer to Chicagoland
103	**Jones Brothers Construction,** Mt. Juliet, TN	$232*	Largest heavy highway construction company in Tennessee
104	**Morrow Equipment,** Salem, OR	$225	High rise boom created 6-month backlog to rent company's 500 tower cranes
105	**Layne Christensen Co.,** Mission Woods, KS	$223	Combined acquired Reynolds and CWI operations

* *Construction Equipment* estimate



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Rank	Company	Equipment Replacement Value ($ in millions)	Comments
106	**Ameren,** St. Louis, MO	$220	AmerenUE invested $2.5 billion in infrastructure since 2002
107	**Ames Construction,** Burnsville, MN	$220*	Widening five miles of SR-189 in Utah's sensitive Provo Canyon
108	**Minnesota DOT,** Duluth, MN	$220	State highway maintenance
109	**Kinross Gold,** Toronto, ON	$217*	North America's 4th largest gold producer
110	**Mid American Energy Holding,** Des Moines, IA	$215*	Acquired OR-based PacifiCorp for $5.1 billion in cash
111	**Herzog Contracting,** St. Joseph, MO	$214*	Heavy constructor specializes in building railroads
112	**New Enterprise Stone & Lime,** New Enterprise, PA	$210	Subsidiaries include Martin Limestone and Buffalo Crushed Stone
113	**Quanta Services,** Houston, TX	$205*	Designs, installs and maintains power, telecom, cable and gas networks
114	**The Hubbard Group,** Orlando, FL	$205	Atlantic Coast's Plant #2 in Jacksonville earned NAPA's Diamond Achievement
115	**City of Los Angeles, Public Works,** Los Angeles	$200	City government
116	**F & M Mafco,** Harrison, OH	$200	Rental and sales organization targets rigging and fabrication contractors
117	**Kokosing Construction,** Fredericktown, OH	$200	Public buildings, process and power plants, water treatment, roads and bridges
118	**New Mexico Hwy. & Trans. Dept.,** Santa Fe, NM	$200	GRIP $1.6 billion initiative finances 40 highway projects in Rio Grande corridor
119	**Tennessee Valley Authority,** Knoxville, TN	$200	29,469 megawatts generating capacity serving 8 million users in 7 states
120	**Titan America,** Norfolk, VA	$200	Tarmac subsidiary acquired Metro Redi-Mix and Elbrecht Concrete in FL
121	**U.S. Army Corps of Engineers,** Washington, D.C.	$200*	Fiscal 2007 construction budget of $1.6 billion funds 63 projects nationwide
122	**Zachry Construction,** San Antonio, TX	$200	Acquired Universal Utility, adding cooling-tower/high-volt.-substation abilities
123	**McDermott International,** New Orleans, LA	$198*	Specializes in power plants, off-shore oil and gas facilities
124	**AT&T,** San Antonio, TX	$190	Consolidated Cingular, Bell South, Ameritech, Pacific Bell, others
125	**Barnhart,** Memphis, TN	$190	Crane company bought Scott Crane Services in Lubbock, TX
126	**Lunda Construction Co.,** Black River Falls, WI	$188*	Bridge division includes pile driving, railroad bridges and concrete work
127	**Washington Group International,** Boise, ID	$185	Subsidiary to manage construction of $1.5 billion uranium facility in NM
128	**Alaska DOT,** Anchorage, AK	$181	New $90 million Fairbanks Int'l. Airport terminal broke ground in July
129	**Rockford Blacktop,** Loves Park, IL	$180	Includes Rockford Sand & Gravel, Rockford Electric, Rockford Environmental
130	**Rogers Group,** Nashville, TN	$180	Crushed stone producer in five states also has asphalt/construction operations
131	**Traylor Brothers,** Evansville, IN	$180	In a JV awarded $9.6 million seizmic-retrofit subcontract by San Francisco BART
132	**Haines & Kibblehouse,** Skippack, PA	$177	Highway-and-heavy firm focuses on quarrying operations
133	**Holcim US,** Dundee, MI	$177*	Swiss-owned cement producer operates 14 plants and 70 facilities here
134	**Arizona DOT,** Phoenix, AZ	$176	Draft five-year plan allots $5.5 billion for highway projects 2007 to 2011

* *Construction Equipment* estimate



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Exceeding Expectations








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Rank	Company	Equipment Replacement Value ($ in millions)	Comments
135	**Cardi Corp.,** Warwick, RI	$176*	Highway/heavy contractor trades on concrete, asphalt, aggregate capabilities
136	**James River Coal,** Richmond, VA	$175*	Acquired 16.5 tons of reserves from Indiana Land and Mineral
137	**Kentucky Dept. of Environ. Protect.,** Frankfort, KY	$175	Mission is to protect and enhance Kentucky's environment
138	**U.S. Department of Energy,** Washington, D.C.	$175	Federal fleet value on the Savannah River Site
139	**Hunt Construction Group,** Scottsdale, AZ	$170*	Completed major stadiums for St. Louis, Phoenix in 2006; started one in D.C.
140	**Insituform Technologies,** Odenton, MD	$170	Fleet value includes that of tunneling subsidiary, Affholder
141	**Rinker Group,** West Palm Beach, FL	$167	Wireless fuel management systems installed in 50 Florida operations
142	**Buzzi Unicem USA,** Indianapolis, IN	$165*	Fourth largest US cement company with 11 plants and 10% market share
143	**City of Dallas,** Dallas, TX	$162	Operates fleet of 4,400 vehicles
144	**O & G Industries,** Torrington, CT	$162	Preservationists' challenge forced CTDOT to shelve $98-million contract
145	**Tutor-Saliba Corp.,** Sylmar, CA	$157	JV with O & G on $242 million Southside Airfield Improvement contract at LAX
146	**Barnhill Contracting,** Tarboro, NC	$155	Acquired grading/paving contractor, Mac Construction in Shallotte, NC
147	**CB & I,** Plainfield, IL	$155*	Golden Pass awarded CB&I $1 billion EPC contract for LNG terminal in TX
148	**Basin Electric Power Coop.,** Bismarck, ND	$150	Plans to complete a new coal-based power plant near Gillette, WY, by 2011
149	**De Silva Gates Construction,** Dublin, CA	$150	In 10 years has placed infrastructure for 3,000 commercial acres/20,000 homes
150	**Francis O. Day Co.,** Rockville, MD	$150	Highway-and-heavy constructor; materials producer
151	**Halliburton Energy Services,** Houston, TX	$150*	Sold KBR's Production Services Group for $280 million
152	**Indiana DOT,** Indianapolis, IN	$150	$3.6 billion lease of toll road will fund 10-year transportation investment plan
153	**Kansas DOT,** Topeka, KS	$150	State highway maintenance
154	**Northeast Utilities,** Hartford, CT	$150	Furnishes electrical service in NH, MA, and CT, as well as natural gas in CT
155	**PPL,** Allentown, PA	$150	Joined FutureGen alliance to develop $1 billion, zero-emiss. coal power plant
156	**Ready Mix USA,** Birmingham, AL	$150*	Over 160 ready mix plants in the southeastern US
157	**TXU Power,** Dallas, TX	$150	Signed InfrastruX to a 10-year, $8.7 billion contract for infrastructure service
158	**U.S. Air Force,** Hickman AFB, HI	$150	Military construction fleet
159	**U.S. Concrete,** Houston, TX	$150*	Acquired Redi-Mix, Ingram Enterprises, Alliance Haulers in TX for $165 million
160	**S.T. Wooten Corp.,** Wilson, NC	$145	Builds roads and bridges, buildings, makes asphalt and ready mix
161	**Flint Energy Services,** Calgary, AB	$145*	Oilfield service provider started 2005 with $700 million infrastructure backlog
162	**IA Construction,** Concordville, PA	$144	Highway-and-heavy-construction division of Colas North America
163	**Orion Marine Group,** Houston, TX	$144*	Holding company for Orion Construction, King Fisher Marine, Misener Marine

* *Construction Equipment* estimate







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Rank	Company	Equipment Replacement Value ($ in millions)	Comments
164	**Finning International,** Edmonton, AB	$143*	Cat dealer has rental fleets in Langley, Prince George, Calgary and Edmonton
165	**PCL Construction Resources,** Edmonton, AB	$143	Ranked 64th on Fortune's 100 Best Companies to Work For list
166	**Laramie Crane & Equipment,** Detroit, MI	$141	Rental; heavy hauling. Subsidiary of Laramie Enterprises
167	**Boh Brothers Construction,** New Orleans, LA	$140	Earned bonus for reopening east. I-10 bridge over Pontchartrain 17 days early
168	**City of Houston,** Houston, TX	$140	Public works and engineering
169	**DuPont,** Wilmington, DE	$140*	Industrial firm
170	**Los Angeles County Sanitation Dist.,** Whittier, CA	$140	Implementing waste-by-rail, including new transfer station and rail yard
171	**Mann Brothers,** Elkhorn, WI	$140*	Highway-and-heavy construction
172	**Westchester County DOT,** Mount Vernon, NY	$140	County roads and transit-system maintainer
173	**Kirby-Smith Machinery,** Oklahoma City, OK	$138	Komatsu dealer's rental fleet
174	**Clarkson Construction,** Kansas City, MO	$135	Working on Kansas City Triangle project, scheduled for completion 2008
175	**Entergy,** New Orleans, LA	$135*	Distributes power to 2.5 million in AR, LA, MS and TX
176	**Hydro One,** Pickering, ON	$132	Largest electricity delivery company in Ontario
177	**International Paper,** Stamford, CT	$131*	World's largest producer of forest products
178	**John Carlo Inc.,** Mt. Clemens, MI	$130	General contractor derives nearly all of its revenues from highway construction
179	**Ryan Inc. Central,** Janesville, WI	$130	Specializing in site work and mass excavation
180	**Briggs Equipment,** Dallas, TX	$129	Case distributor with 18 locations in NC, SC, GA, and FL
181	**ECCO Equipment,** Santa Ana, CA	$129	Over 700 pieces of heavy earthmoving equipment in the Western U.S.
182	**The Shaw Group,** Baton Rouge, LA	$128*	Contracted under USAF $6 billion Heavy Engineering Repair program
183	**American Infrastructure,** Worcester, PA	$127	Subsidiary R.G. Griffith started Harbor-Station site work, will go into Oct. 2007
184	**C.W. Matthews Contracting,** Marrietta, GA	$125	Asphalt producer/leading contractor for GA DOT w/fleet of over 500 machines
185	**Michels Corp.,** Brownsville, WI	$125	Pulled 20-inch pipe 7,600 feet across the St. Lawrence River
186	**Parsons,** Pasadena, CA	$125	Acquired RCI Construction, largest minority-owned business in WA, in 2005
187	**West Virginia Div. of Highways,** Charleston, WV	$125	Maintains 37,000 miles of highway
188	**New Jersey DOT,** Trenton, NJ	$124	2007 transportation program funds $3.2 billion in construction
189	**Centex,** Dallas, TX	$122*	Fiscal 2006 revenues grew 23% to $14.4 billion in tenth record year
190	**Tarco Inc.,** Arvada, CO	$121	Fields 34 crews doing earthmoving, utility and concrete work
191	**N.A. Degerstrom,** Spokane, WA	$120	Mining and heavy construction firm
192	**Fisher Sand & Gravel,** Dickinson, ND	$120	Operates 40 aggregate plants and a fleet of 2,000 machines

* *Construction Equipment* estimate

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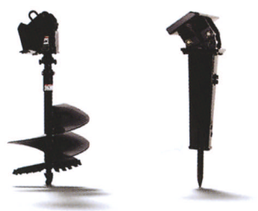

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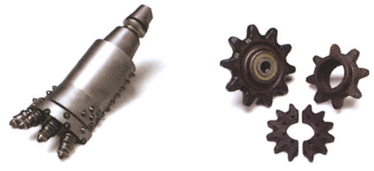

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Rank	Company	Equipment Replacement Value ($ in millions)	Comments
193	**Matrix Service,** Tulsa, OK	$120	Industrial contractor projects FY 2007 revenues of $480 to $520 million
194	**Republic Services,** Fort Lauderdale, FL	$120	No. 3 waste handler has 60 landfills, 90 transfer stations, 35 recycling centers
195	**URS,** San Francisco, CA	$120*	Includes Aman, Banchee, Cleveland Wrecking, EC Driver & Assoc.
196	**AECON Group,** Toronto, ON	$118	Canada's top public constructor, awarded $100 million in infrastructure work
197	**Patten Rental Service,** Elmhurst, IL	$118	Caterpillar rental fleet of 350 machines in 7 Illinois and Indiana locations
198	**American Bridge,** Coraopolis, PA	$117*	Awarded a $52M contract to replace deck of west. Chesapeake Bay Bridge
199	**Canter Construction,** Wilkesboro, NC	$115	General building contractor
200	**Fred Weber Inc.,** Maryland Heights, MO	$115	Recently awarded three Missouri DOT projects totaling $18.9 million
201	**R.E. Monks Construction,** Fountain Hills, AZ	$114	Operates 500-machine fleet of Tier 2 equipment
202	**Irving Materials (IMI),** Greenfield, IN	$112	Ready-mix firm fields 850 trucks and 130 plants in IN, KY and TN
203	**Jakes Crane & Rigging,** Las Vegas, NV	$112	Rental fleet investing in support equipment
204	**Perini Construction,** Framingham, MA	$112*	Purchased Redwood-CA-based builder, Rudolph and Sletten, for $53 million
205	**Salt River Project,** Phoenix, AZ	$111	Utility to construct $600 million, 400-megawatt coal-fired power plant
206	**Rieth-Riley Construction,** Gary, IN	$110*	Purchased Consumers Asphalt in April 2006
207	**Centerpoint Energy,** Houston, TX	$110*	Will develop 1,600-mile Mid-Continent gas pipeline with Duke Energy
208	**Mashuda,** Cranberry Township, PA	$110	Highway and heavy contractor
209	**Norfolk Dredging,** Chesapeake, VA	$110	Specialist in sub-aqueous trench/tunnel excavation, backfill, hydraulic landfill
210	**Sherwood Construction,** Wichita, KS	$110	Heavy constructor includes a family of 17 companies
211	**Sims Crane & Equipment,** Tampa, FL	$110	Rental fleet value has grown $50 million in 36 months
212	**Xcel Energy,** Denver, CO	$110*	Part of CapX 2020 alliance to construct $1.3 billion in new transmission lines
213	**Fordyce Ltd.,** Victoria, TX	$108	Sand and gravel producer
214	**City of Calgary,** Calgary, AB	$107	Exploring hybrid and alternative-fueled vehicles for fleet of over 4,000 units
215	**McKinney Drilling,** Odenton, MD	$105*	Founder pioneered drilled-shaft processes
216	**TIC Holdings,** Steamboat Springs, CO	$105	Expertise in building power, mining/minerals process, oil/gas/chem. facilities
217	**W.O. Grubb Steel Erection,** Richmond, VA	$105	About half of the firm's 200 cranes are Manitowoc-Crane-Group machines
218	**Toromont,** Toronto, ON	$101*	Rental-fleet value, operated primarily by Battlefield Cat Rental Store
219	**Alberici Constructors,** St. Louis, MO	$100	Selected to build Platte West Water Treatment Plant in NE for $235.7 million
220	**American Asphalt & Grading,** Las Vegas, NV	$100	Grading, paving, mine-reclamation fleet includes two Komatsu D575A dozers
221	**Austin Industries,** Dallas, TX	$100	Landed $153 million contract to build four-level interchange in Texarkana

* *Construction Equipment* estimate

Rank	Company	Equipment Replacement Value ($ in millions)	Comments
222	**Bauerly Brothers,** Sauk Rapids, MN	$100	Supplies aggregate, asphalt and concrete to 29 Minnesota counties
223	**Conoco-Phillips,** Bartlesville, OK	$100	Third-largest integrated energy company in the US
224	**Edward C. Levy,** Detroit, MI	$100	Produces construction materials from steel and construction waste
225	**EKPC,** Winchester, KY	$100	Eastern Kentucky Power Cooperative
226	**Engelhard,** Iselin, NJ	$100	Miner acquired in June 2006 by chemical giant BASF
227	**English Construction,** Lynchburg, VA	$100	Heavy structures contractor's fleet value increased $45 million in 48 months
228	**Graniterock,** Watsonville, CA	$100	A 6th NAPA Diamond Achievement goes to Northern Road Materials facilities
229	**Gray BEC Lime,** Pleasant Gap, PA	$100	Mining subsidiary of Graymont
230	**Henkels & McCoy,** Blue Bell, PA	$100	Utility and industrial contractor founded in 1923
231	**Hinkle Contracting,** Paris, KY	$100	Highway construction, materials producer, environmental work
232	**HRI,** State College, PA	$100	Highway-and-heavy contractor is a division of Colas North America
233	**Hunter Industries,** San Marcos, TX	$100	Highway constructor owns Colorado Materials
234	**Illinois DOT,** Springfield, IL	$100	Current phase of Transp. Enhancement spends $60 million on 107 projects
235	**Imperial Crane Services,** Bridgeview, IL	$100	Truck cranes to 500 tons, lattice boom and crawler cranes to 300 tons
236	**Iowa Department of Transportation,** Ames, IA	$100	Implementing $374-million FY2007 Highway Program
237	**J. Fletcher Creamer & Son,** Hackensack, NJ	$100	New Jersey contractor
238	**Kinder Morgan,** Lakewood, CO	$100	Acquired A&L Trucking and U.S. Development Group for $61.6 million
239	**Lehman-Roberts,** Memphis, TN	$100	Predominantly highway construction
240	**Metropolitan Washington Airport,** Washington, D.C.	$100	Airport-maintenance equipment fleet
241	**Montana DOT,** Helena, MT	$100	56-mile, $150 million Peoples Way project in progress until 2009
242	**Nevada DOT,** Carson City, NV	$100	State highway maintenance
243	**Orius,** Twin Falls, ID	$100	Filed Chapter 11 in an agreement to sell $8 million in assets to Dycom
244	**Ring Power,** Jacksonville, FL	$100	Cat dealer rents equipment from locations in 18 Florida cities
245	**Scotty's Contracting & Stone,** Bowling Green, KY	$100	Highway and heavy construction; materials production
246	**Solar Sources,** Indianapolis, IN	$100	Coal miner
247	**Star Industries,** Seattle, WA	$100	Family-owned rental company has 16 locations in Washington and Oregon
248	**The Doe Run Co.,** St. Louis, MO	$100	Lead-mining subsidiary of the Renco Group
249	**Veco,** Anchorage, AK	$100	Highway construction, utilities and oil-field service company to the world
250	**W.A. Hazel,** Chantilly, VA	$100	Site development specialist

* Equipment-replacement values are compiled by *Construction Equipment* magazine using information provided by the individual companies. When figures were not provided (identified with an asterisk), *Construction Equipment* estimated fleet value. The *Construction Equipment* Giants list (a portion of which is published here) represents as closely as possible all firms that own fleets with replacement values of $25 million or more. This list is also available at ConstructionEquipment.com. If you feel your firm qualifies as a Giant, please write to Larry Stewart, *Construction Equipment*, at lstewart@reedbusiness.com or phone 314-962-0639.

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By TOM BERG, Truck Editor

Monster Pickups Are More Than Toys

Accubuilt's rendition of the really-big-pickup theme is capable of some serious hauling and towing

Ford's SuperDuty F-550 is a midrange chassis that usually totes some kind of no-nonsense utility or dump body, yet this one has a pickup bed. Does that make it a toy for well-heeled consumers? Yes and no. It is aimed primarily at people who like to spend a lot of dough on their hobbies, like boats, horses and RV travel.



Spray-in liner is standard and fifth-wheel hitch is available. There's no Ford-factory F-550 4x4 pickup, so decals on the fenders were designed and printed by a local supplier.



This Completed Crew Cab has fancy Lariat trim. The box looks stock, with correct gap between bed and cab, but it's reinforced to take high payloads allowed by the midrange chassis.



But as set up by Accubuilt Inc., a specialty manufacturer based in Lima, Ohio, it can haul and tow some serious loads and therefore might be useful to commercial users.

As any truck nut knows, pickups have grown in size and weight capabilities, but until a couple of years ago didn't go beyond the "1-ton dually" class, which in Ford's case is the F-350. Then General Motors and International Truck kicked off what I call the "really-big-pickup" thing with special versions of their midrange models.

International's CXT, based on a 7300 Class 6 chassis with four-wheel drive and a modified bed, somehow garnered gobs of publicity from the mainstream media. Their writers gushed over the CXT's sheer height and size, but said little about its hauling and towing capacity. I drove the CXT when it was a preproduction truck called Big Yellow and did a suitably oh-wow report for this magazine. But CXT has remained more a curiosity than a seller. International has since introduced two other versions, the RXT 4x2 for personal-use towing and MXT 4x4 for possible military markets.

The GMC TopKick and Chevrolet Kodiak C4500 pickup with a bed from Monroe Truck Equipment hasn't gotten as much notice, but I've seem 'em on the road. Recently I drove one at a GM all-brands event in Nashville, Tenn., when it was hooked to a 38-foot horse trailer that, at 18,500 pounds empty, pushed the limits of its tow capacity. Yet the bulky truck gamely yanked the bulkier trailer down a couple of interstate highways and over city streets. Last year I spotted a C4500 pickup in California towing an equipment trailer with a backhoe aboard — an actual working truck.



Accubuilt assembles strengthened pickup beds and mounts them on medium-duty F-450 and -550 chassis in its plant in Lima, Ohio. F-650 pickups are planned.

Accubuilt possibilities

So it is, or could be, with Accubuilt's conversions. In its literature, the company notes that a pickup bed is a versatile design that can do a lot of hauling jobs. Construction contractors and tradesmen needing high carrying or towing capacity could use big pickups like these because they'd enhance a company's image, could be driven to the proverbial country club, and their resale value would almost certainly be higher than for a bare-bones truck.

The company obtains SuperDuty F-450 and -550 cab-chassis vehicles from Ford, plus parts for SuperDuty pickup beds, and assembles them. Of course, there's much more to it; Ken Earnest, Accubuilt's marketing manager, explained that the beds are not just "take-off" boxes. Engineers have beefed up the basic 8-foot bed with four 19-gauge galvanized steel reinforcers mounted

cross-ways under the floor so it can carry payloads of up to 11,300 pounds.

They also adjusted the fiberglass fenders and wheel wells to match the wheelbase of the chassis. A sprayed-in bed liner and a 50-gallon fuel tank mounted ahead of the axle are standard, as is a full-size spare tire mounted under the bed ahead of a hefty steel bumper with a hitch receiver and electrical hookups. A bed-mounted hitch is available for pulling fifth-wheel trailers. Depending on type of cab and truck load, the F-550 will pull up to 24,900 pounds.

Buyers can choose the standard leaf-spring rear suspension or opt for an air-bag setup that Accubuilt also designed. I drove empty F-550s with each suspension type and found them stiff but not uncomfortably so. I couldn't tell any difference in ride quality, but Earnest said most folks can. And the air-bag suspension with its electric pump reacts to loads by adjusting a truck's rear-end height. Incidentally, do you need replacement leaf springs for your own midrange SuperDuty? He will happily sell you some of those removed to make way for the air suspensions on these trucks.



Optional air-bag rear suspension was designed by Accubuilt and replaces stock leaf springs.

Pickup options

Accubuilt offers its pickups with Regular, Super or Crew Cabs in three trim levels, and with gasoline V-10 or diesel V-8 power. "We did one with the V-10, just to say we did it, but it's still not sold," Earnest said. "Everyone wants the diesel." Most buyers also want the four-door Crew Cab and four-wheel drive, as well, and that's how the two trucks I drove were set up. Both had Lariat trim, complete with leather seat covers and other plush pieces that made them as upscale inside as a Lincoln Town Car.

And they were quick! With the bed empty, a 325-hp Power Stroke running through the standard 5-speed TorqShift automatic will spin the rear tires on dry concrete. I almost did that, but let up on the accelerator when the wheels began hopping as I shot my way onto a busy street. The engine's guts would be put to more righteous work if the bed were loaded or a heavy trailer were tagged on behind.

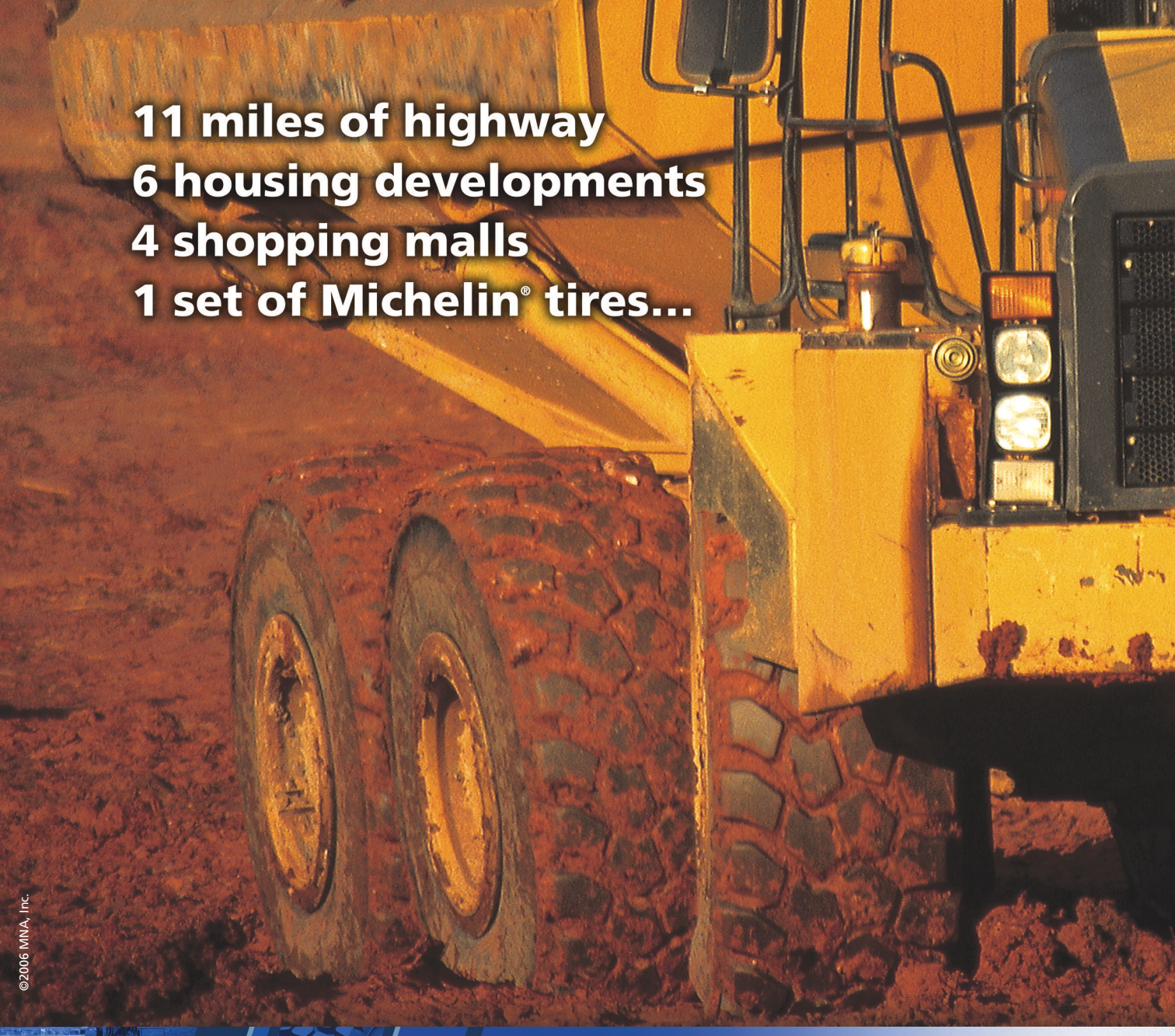
To be sure, this style and capability don't come cheap. The stickers I saw ventured well into the $60K range. If the F-450 or -550 chassis isn't capable enough, you'll soon be able to get an F-650 pickup from Accubuilt. It distributes the trucks through Tuscany Automotive, a recently acquired upfitter that supplies vehicles to many Ford dealers. Because most parts are from Ford, factory warranties stay intact. How practical can a toy get?

International's latest big pickup is the RXT 4x2 (right), set up for enthusiasts who tow heavy trailers. It's more low slung than the high and heavy CXT 4x4, which made a big splash with the mainstream news media.





A GMC C4500 pickup with bed by Monroe Truck Equipment ably pulled this long, heavy horse trailer during a recent General Motors expo. But it would've struggled with horses and tack aboard.



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By LARRY STEWART, Executive Editor

Seals Save Cylinders

Controlling dirt and heat preserves seals, and that extends the life of cylinders and other hydraulic components

QUICK TIP

Need a Breather

Hydraulic systems that are not sealed gulp in dusty ambient air through the reservoir breather every time the fluid level drops. Dirt entering the reservoir circulates through the whole system before it can be removed by a return-line filter. To protect the seals and tolerances, the breather should be fit with a filter that's every bit as efficient in the same contaminant-size range as the main system filters.

Maintenance programs that quickly repair seal leaks are integral to controlling hydraulic-system repairs and downtime. It's not a hard policy to justify. Wear is as easy to see as a drip of oil in the dust, and the vast majority of cylinders in construction equipment can be re-sealed in four hours for less than $250. On the flip side, working with a leaky cylinder starts a chain reaction of wear that cuts short the life of valves and pumps.

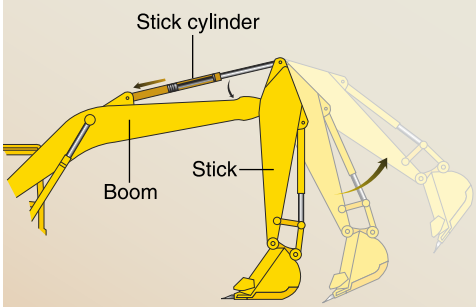
Once a seal begins to wear, it becomes less effective. Sharp edges designed to shear oil off the rod or cylinder barrel become rounded and let more oil pass. When the rod retracts, some oil is scraped off by the dust wiper and you get a slobbering or drippy hydraulic cylinder. Now's the time to replace those rod seals.

The reason repairing leaky rod seals is so critical is that as oil leaks out, dust gets in. Abrasive contaminants clinging to the oil film on the rod ride past the leaky seal and head downstream from the cylinder in the hydraulic lines. The first component downstream is typically a valve. Dirt particles wedge between the barrel and spool and gouge the surface. The valve's metering surfaces begin to erode.

The other significant source of contaminant in hydraulic systems is the reservoir breather. Many systems are sealed, but those that are not gulp in ambient air every time the fluid level drops in the reservoir. As cylinders extend, they draw oil from the reservoir. The fluid level drops, and air-loaded contaminant is sucked in through the breather. To protect the system's seals and tolerances, the breather filter should have the same beta ratio or efficiency rating as the system's fluid filters.

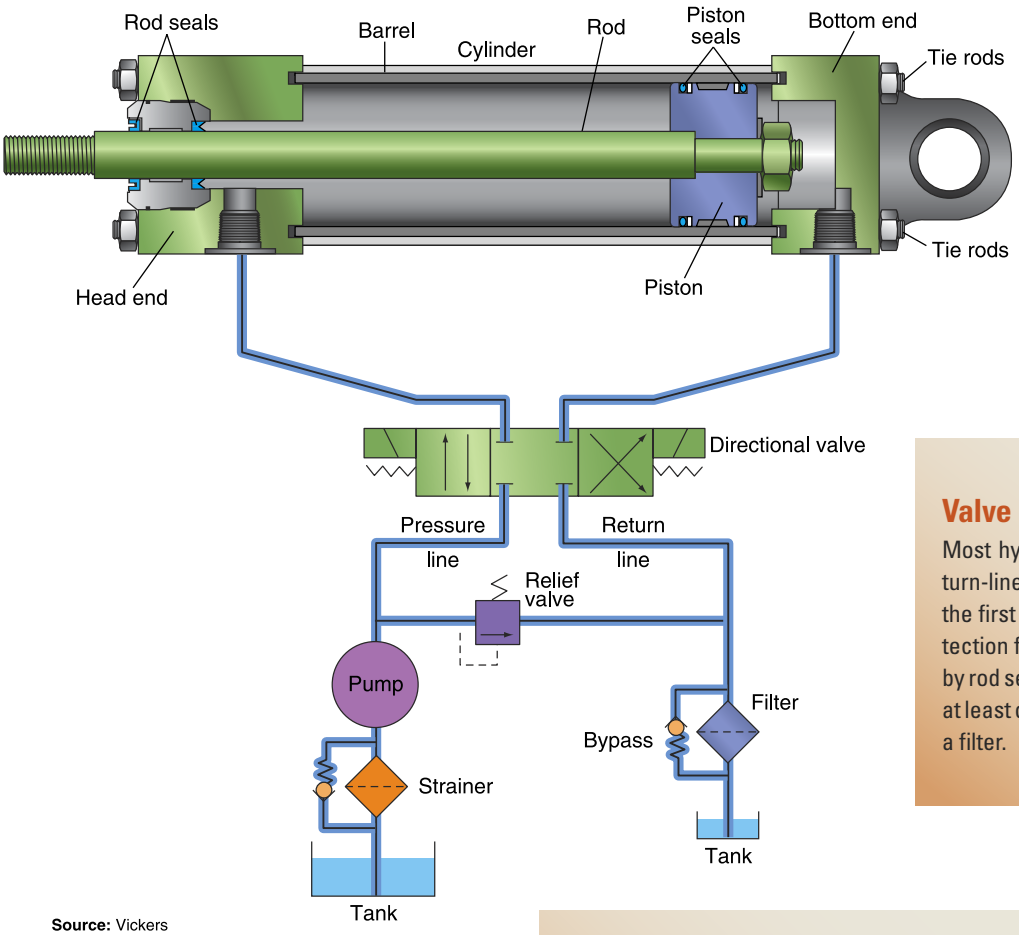
Control the heat

Contaminants slipping past the rod wiper wear down the piston seals — the critical interface for hard work. If piston seals don't contain oil on the high-pressure side, piston and cylinder efficiency suffers. Load-sensing hydraulic systems will compensate for some internal leakage by pumping more fluid, but when the cylinder is in neutral, it won't support a heavy load. It begins to drift.



Avoid Side Loading

Grease cylinder mounting points to preserve seal life. If the clevice that retains the eye of this stick cylinder is dry and bound up, when the cylinder retracts to extend the stick, as the stick pivots on its boom pin the cylinder rod wants to swing in a downward arc. The piston scrapes the barrel and the rod exerts force on one side of the head. The seals, and eventually the rod and piston, will be worn oval. None will last for a satisfying length of time.



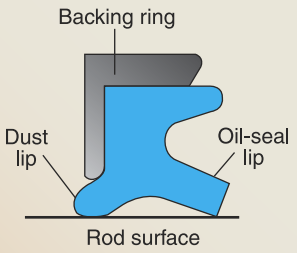
Source: Vickers

Valve Protector

Most hydraulic systems use a return-line filter, so the cylinder is the first line of contamination protection for valves. Dirt that sneaks by rod seals into the system scours at least one valve before it reaches a filter.

Dull Dust Seal

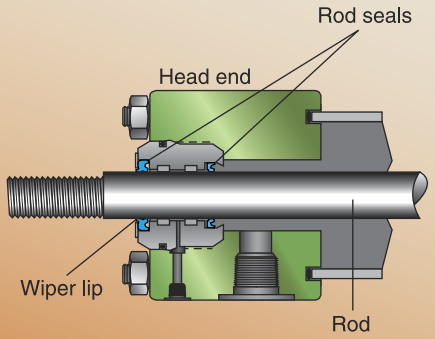
Install the final dust seal with its dull edge outboard. This wiper lip is designed to repel all but the very finest dirt. The sharp edge is an oil seal. Special seals with a sharp wiper lip can be used to protect cylinders working in very wet conditions.



Source: Komatsu

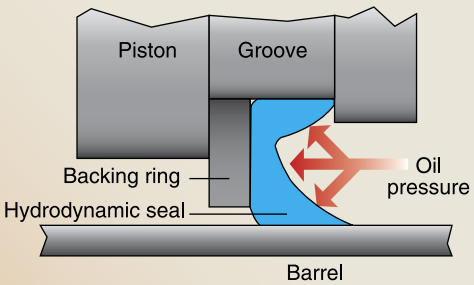
The Front Line

Rod-seal failures are typically visible because they drip. Even before it affects performance, seal leakage is unacceptable because it ushers dirt into the hydraulics. Weeping oil also compromises safety, the environment and appearance.



Oil-Assisted Seal

The open cup of a U-cup or V-cup seal faces the pressure side, so oil presses the lip against the sealing surface. They're frequently installed in sets as piston seals. In double-acting cylinders, two sets are used, each facing a pressure side of the piston.



Source: Vickers

In their service manuals, equipment manufacturers publish acceptable rates of drift and methods of measuring it. The process is simple — usually just raising the implement, placing the valve in neutral, and measuring how far it drifts during a fixed period of time. Measuring drift should be part of the regular inspections of any machine with hydraulic cylinders. When a cylinder drifts too much, the piston and head should be resealed.

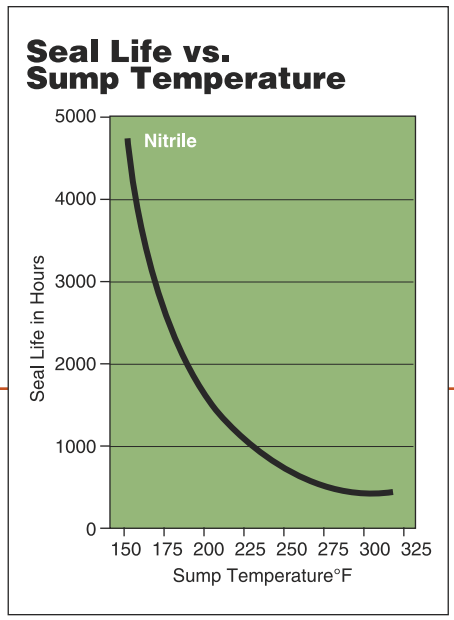
Ignoring drift accelerates wear throughout the hydraulic system. Oil squeezing past piston seals creates a lot of heat. Oil degrades at higher temperatures, so lubrication breaks down. Metal-to-metal wear in valves, pumps and motors increases. Heat rapidly ages seals throughout the system.

Hydraulic systems are typically designed to operate at about 130 degrees Fahrenheit. Temperatures under the lip of a seal will be somewhat higher (as much as 50 F higher on rotating shafts) than system temperature because of friction at the seal surface. When temperatures climb above 180 F, seals begin to harden.

Hot Oil Cooks Seals

An increase in operating temperature of 25 degrees Fahrenheit can cut seal life in half, according to Chicago Rawhide, a division of bearing manufacturer SKF that makes seals. It's the temperature under the lip of the seal that matters, and it can be as much as 50 F hotter than sump temperature.

If the oil is not suited for the application, lip temperature will climb and shorten seal life. Other factors that raise hydraulic temperature include extreme ambient temperatures, low hydraulic fluid level, dirty oil coolers, or problems with engine cooling.



An increase in operating temperature of 25 degrees Fahrenheit can cut seal life in half.

When seal leakage advances to the point where the rod begins to wear against its bearing or the piston scrapes the cylinder barrel, the whole hydraulic system is in trouble. Even after the cylinder is rebuilt or replaced, valves, pumps and motors often continue on their way to early failure unless the system is thoroughly flushed and the fluid cleaned.

Other sources of wear

In the ranking of most common cylinder killers, side loading is a distant third to contamination and heat. But it's worth noting because it's fairly easy to prevent.

When the pivot point where the rod connects to the machine is not greased regularly, the rod's eye binds on the pin that connects it to the implement. As the piston extends or retracts and sets the implement in motion, the piston rod wants to swing with the implement. There won't be enough force to bend or break the rod, but the lateral forces wear on the rod and piston seals.

Regular greasing will help keep the eye free to turn on the mounting pin. But it's a good idea to check the rod bearing for roundness when the head is torn down. Mark its orientation in the head before removing it. If the bearing is elongated, you can orient it in the head again to determine where the side loading occurs.

Chemical compatibility can also increase seal wear. If a foreign fluid — such as transmission fluid or brake fluid, glycol or diesel fuel — gets into the hydraulic system, it can age most hydraulic seals prematurely.

Nicks or dings in the cylinder rod that are big enough to catch a fingernail can ruin rod seals, too. A damaged rod should be repaired or replaced, and its seals replaced, immediately.

Preserving seals is the key to long cylinder life. They must be kept lubricated to prevent fast wear on their elastic surfaces. The goal is not a dry rod, but one on which there is no obvious quantity of fluid. It's pretty easy to see when they need attention. It's critical that they be serviced as soon as wear starts to show.

This article originally ran in the January 2001 issue.

Good Things Come in 3s

Meet the New Zaxis Dash-3 from Hitachi.

IMPROVEMENT: ENGINE
Isuzu's Tier-3-certified engines not only comply with all emissions standards, they now feature four-valve OHC and a new common-rail fuel-injection system. The results are up to 11-percent increased engine output, 6-percent increased torque, and 8-percent reduced fuel consumption. A strengthened cylinder block and ladder frame increase engine life.

IMPROVEMENT: HYDRAULICS
Hitachi's Dash-3 hydraulics are smarter and more responsive to bucket resistance. Multiple sensors instantly feed automatic micro-adjustments for increased hydraulic power to maintain steady, sure movements. Boom, stick, and bucket cylinders feature regenerative flow for faster down movements, extremely fine control, and multitasking.

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A bigger, quieter, more accessible cab with improved legroom, more visibility, and an improved digital monitor system makes the Dash-3 excavator even more pleasurable to operate. The monitor provides quick access to the machine's performance history and diagnostics.

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By G. C. SKIPPER, Contributing Editor

Equipment Technology Challenges Repair

Manufacturers wrestle with how to adequately communicate repair information on today's high-tech machines



Manufacturers engage end-users in their design processes, and this will often result in service and maintenance enhancements in machine design. Photo: Case Construction Equipment

When wagons went west for the first time, chances are that the relationship between man and machine was complex — downtime from broken axles, rusted wheel rims, split wagon seats, and ripped canvas tops.

Of course, vehicles have changed drastically from horse-drawn wagons to horse-powered units, and the man-machine relationship has become increasingly complex. That is especially true in the construction industry. With the aggressive advance of technology, another dimension has evolved in that relationship, namely the engineering and design of the machine and its impact on the field technicians who have to repair them.

The Society of Automotive Engineers has established maintainability standards that address such issues as serviceability and repairability. These standards, as one OEM executive describes them, have proven "effective from the engineering and marketability point of view." Yet he admits, "from the repair and maintenance side of the business, where I've spent most of my career, it's been more like something we've had to contend with. It's a challenge to even meet and manage these targets."

That raises the question: Is there a growing gap between OEM engineers and designers and the field technicians responsible for maintaining machines? OEMs, in general, say no. There are other issues involved, they say, such as how you define serviceability; the shortage of good, trained mechanics; the need for easier interface between electronic diagnostic tools and mechanics; and the fact that numerous new products are developed because of new technologies and regulatory requirements. It's not a gap, they say, but a challenge for OEMs to convey complete, timely information as fast as possible to repair technicians.

Yet one research organization, International Data Corp. (IDC) in Framingham, Mass., sees a different landscape. IDC has 800 analysts in 60 countries who track markets and technologies in various industries, including on- and off-highway segments. IDC tracks manufacturer best practices and developing industry trends. IDC project manager Joe Barkai has focused on the U.S. construction industry, including the SAE maintainability standards.

"The standards talk about maintainability, but they really measure time on moving and

replacing parts, which is part of the repair process," Barkai says. "That is one element — time to analyze the part and tools required to access the part. Most manufacturers still struggle with the question, 'how do I know this is the part to remove?'

Capability

It's okay to say, I've just improved serviceability by cutting time to replace a part by 20 minutes, but the question still remains, how do I know it's the right part?

"The fundamental difficulties in serviceability are knowing which part is to be accessed and knowing what tools are needed," he says.

IDC tracks the efficiency of such things as no-fault-found rates and first-time-fix rates. "No fault found" means the part was replaced, but no fault was found with it when it was returned to the lab for testing. "First-time fix" means the first attempt at repair was successful. "What we've found is not good news," Barkai says. "The average no-fault-found is about 30 percent. If you segment that by type of product and type of component, such as electronics, you are at 80 percent no-fault-found."

Barkai says these numbers indicate poor serviceability. "We also look at what happens to the rest of the machine, to that 30 percent that didn't get fixed right the first time," he says. "What we have found is that those machines tend to come back for more than one repair. So statistically, it is very likely your machine will have to be repaired more than once until it's done right. On the maintainability issue, we just don't have tools good enough to precisely diagnose problems."

Warranty claims have "gone through the roof," Barkai says. "The average cost for warranties in auto and off-highway companies is about 2 percent of their product sales. This is a lot of money." OEM executives need to "be aware of the cost of poor quality, poor diagnostics, and poor repair practices," he says. "Maintainability needs to take a much stronger role in design than it does today."

Although OEMs such as Caterpillar, Volvo Construction Equipment and Case Construction Equipment agree with IDC research that suggests maintainability needs to take a greater, more important role in equipment design, they disagree with the 30 percent no-fault-found figure as well as the claim that there is a growing gap between OEM engineering and design and field technicians that must maintain the machines.



Training in troubleshooting techniques gives managers and technicians a better chance of determining why a machine is not performing properly. **Photo: Volvo Construction Equipment**

"No fault found occurs when an assumption is made about where the failure or problem is occurring," says Dave Hildebrand, general sales manager for customer support. "Most technicians today have the viewpoint that if I can narrow it down to a few components I can disconnect or replace, then I've fixed the problem. And what we find, generally speaking, is that the root cause often times on a no-fault-found problem is never addressed. There is something else within the system that makes it appear as though the component is the problem."

He gives alternators as an example. Many times alternators are replaced and blamed for the problem. "The alternator is not designed to take flat battery back up, and when the mechanic puts another alternator back in, it burns out again. In that case, yes there is an alternator failure, but the fault is not with the component that failed. It's because the battery wasn't fully charged to keep the alternator fully charged."

It's all about troubleshooting, says Dave Ross, vice president of engineering for Volvo motor graders. "The serviceability index does not directly deal with steps required to troubleshoot and determine the possible root cause. In these cases, it takes three things to come to a conclusion on root cause. One, you must be knowledgeable in the topic. Two, you must have information or data. Three, you must be skilled in solving problems, or have a tool that does it for you. Once you know definitely what the issue is, servicing the part is relatively easy."

Bill Springer, Caterpillar vice president of marketing and product support division, says proper technician training helps. "We've done some analy-

sis ourselves and have determined that most of the no-fault-found situations can really be remedied by providing better troubleshooting skills to the technician. It really starts with proper tests and adjusting techniques on the components themselves. If you've got the right test and adjusting procedures in place, then it makes diagnostics much better."

Caterpillar has spent a lot of time and effort in ensuring diagnostics are right at the time of new-machine introduction, Springer says. "We've found that no-fault claims are well below the 30 percent average mentioned by IDC. As part of our new-product introduction process, our product engineers are deeply embedded early on to make sure we have the best possible serviceability. This is a huge issue as far as maintainability of the product goes."

Hildebrand says that the industry, in general, "has further to go to meet the end-user/customer demands when it comes to complex diagnostics and the correct repair the first time."

"The focus and effort of Volvo has been reducing failures or the actual number of events the machine is considered down for unscheduled maintenance and/or failures that lead to downtime and loss of productivity," Hildebrand says. "The actual time and expertise to correct this type of failure is what the end-user is concerned with when it comes to repairability."

Although the construction industry continues to improve on its efforts to meet end-user demands in this area, OEM executives say they don't see a growing gap between OEM design and field technicians who have to repair the units. Springer considers the situation "a continuing challenge."

"The reason I say that is because of the number of new products and technologies that have

An End-User's View

Dave Markey, vice president, equipment services for American Infrastructure, is one end-user who agrees with research that portrays a gap between OEM engineers and designers and field technicians.

Markey is in a unique position to see both sides of the issue since, prior to becoming an equipment manager, he spent 20 years as an equipment dealer.

Although he agrees that one reason for the gap is the widely recognized shortage of qualified technicians, he says the primary reason is because not enough information is shared between the end-user and the OEM/dealer network.

"Some dealers are very progressive and have training at the dealership level," Markey says, "but at the manufacturing level, it's a little more difficult. There are one or two OEMs out there who are progressive, but in general, there is information that we have a great deal of trouble getting. It takes a lot of clout and knowing the right people to get the information."

There could be litigation issues and proprietary issues involved, he says. "Every business wants to — and has a right to — safeguard proprietary information. But I'm sure there is enough common ground that we can improve the situation in training opportunities."

Some of the information-sharing has come a long way from years ago, he says, but machines have become more complicated. Anytime more information and training are shared with the objective of keeping equipment running is good for all concerned.

"I'm not sure I care whose color shirts get the job done — the dealer's blue, my green or somebody else's grey," Markey says. "We have to get this done together as a team. The successful manufacturer, the successful dealer, and the successful end-user are the ones who keep the equipment running. The sooner we develop a teamwork strategy, the better off we will be overall."

It all comes down to building a good relationship, Markey says. "You have to make some judgment on how much you can tell each other."

He says he worried about this when he was a service manager with a dealership. "I was concerned when people would call and say, 'this is my problem,' or ask, 'how do you do this?' I asked myself, are we on the same page so that I can speak freely and help the guy, or am I going to tell him enough so he's going to go out and hurt himself or someone else?"

Markey says his company buys a lot of new equipment, and warranties are important. "Warranties represent a risk," he says. "You have a risk factor in that the machine may break down and have financial consequences. It is a matter of who will bear the risk."

Although he can't speak for manufacturers, he says there should be some type of warranty fund where a certain amount of money is allocated by OEMs to cover warranties, based on the track record of failures. "Manufacturers must have some funds to cover the risks. In the end, they hope they can manage the risk to where it washes out or stays in the black."

Toolbox Tips

Sponsored by Hertz Equipment Rental

September 2006

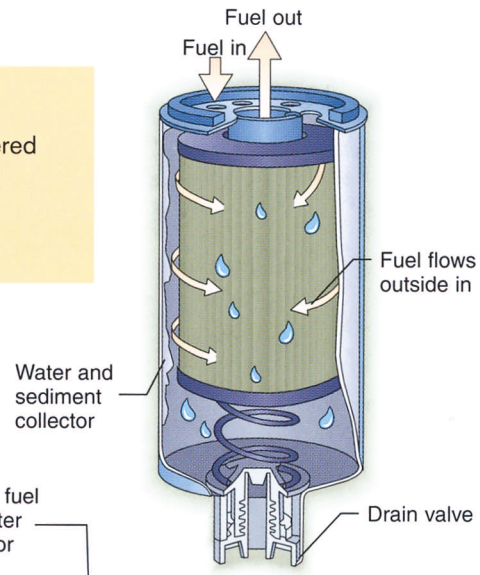
No. 22 in a Series

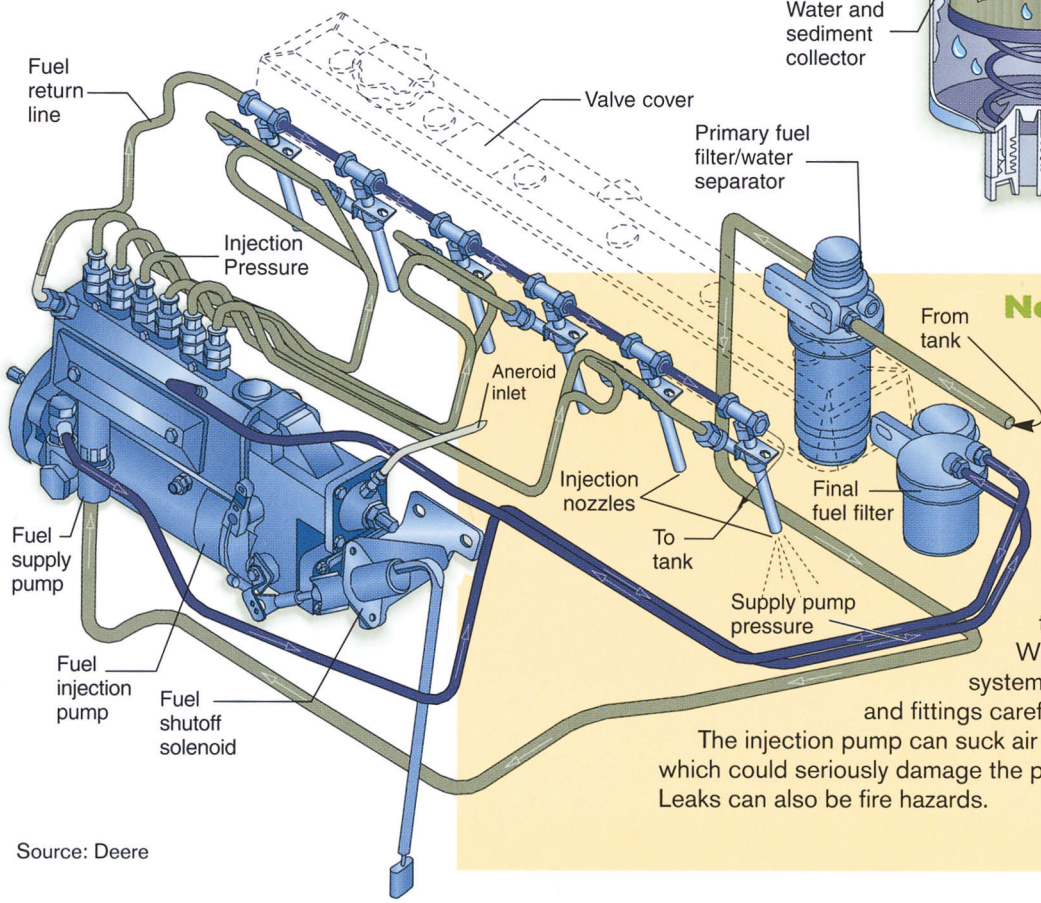
Basic Service Makes High Efficiency Fuel Filters Last

Install Filters Dry

If you pour fuel into a filter before installing it, that fuel will not be filtered before it reaches the injection system. Wear caused by even a little contaminant is not worth saving a few strokes on the priming pump.

Source: Komatsu





No Leaks Allowed

Fuel hits the primary filter first, where water and some solid contaminant is stopped. Then it is pressurized in the injection pump and is polished by the secondary filter. When servicing the system, fasten fuel lines and fittings carefully to prevent leaks. The injection pump can suck air into its supply lines, which could seriously damage the pump or injectors. Leaks can also be fire hazards.

Source: Deere

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Toolbox Tips

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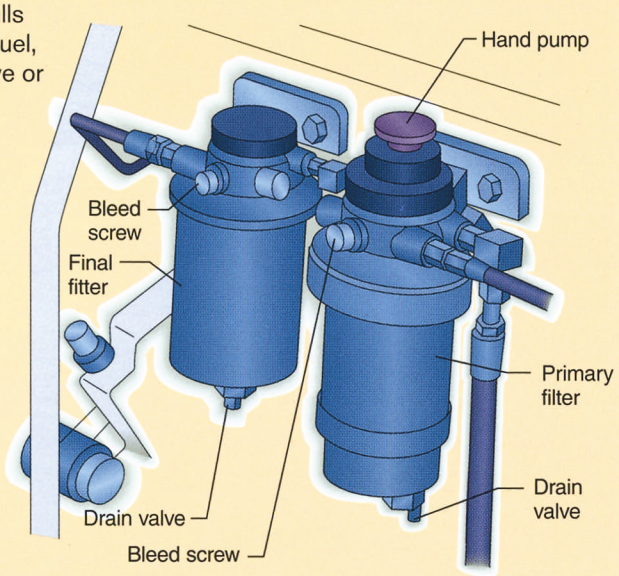
Prime The Pump

Priming the fuel system fills new filter elements with fuel, displacing the air. Remove or loosen the bleed plugs before pumping. If the engine does not start after priming, air is probably trapped in the lines. Loosen all the fuel-injection lines at the cylinder head and crank the engine to bleed the lines. Retighten fuel line nuts to specified torque.



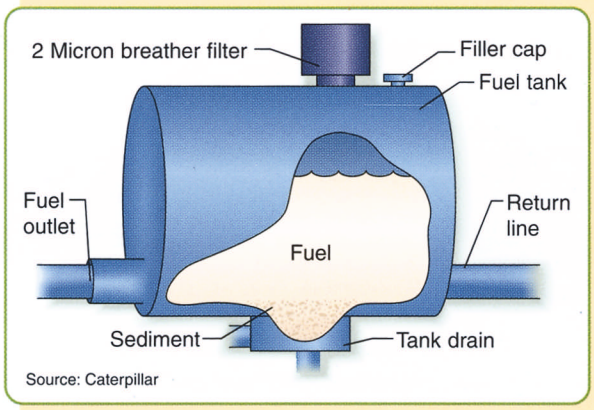
Source: Deere

QUICK TIP

Avoid Fluid Injection

Fuel escaping from lines under pressure can penetrate the skin, causing serious injury. Relieve pressure from the system before disconnecting lines. Tighten all connections carefully before applying pressure to the system again. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand. Fluid injected into the skin must be surgically removed within a few hours by a doctor familiar with this type of injury, or gangrene may result.

Beefed-Up Breather



Source: Caterpillar

The tank drain should be emptied daily to keep water and sediment out of the fuel outlet.

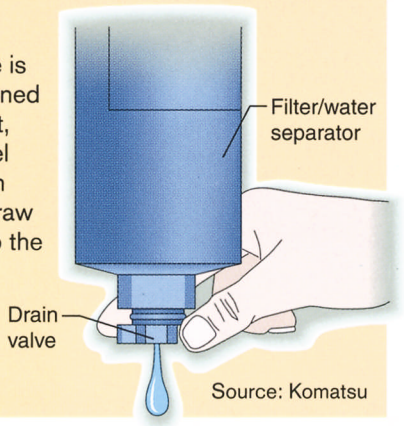
You can keep extremely dusty operating conditions from reducing injector life very simply by using a better filter on the fuel-tank vent. A 2 micron breather filter is inexpensive, because air comes through it very slowly. The $15 filter normally requires replacement only once per year, and it can double the life of secondary fuel filters working on the worst sites.

Breather filters should be located near the top of the fuel tank's standpipe. Standpipes should have adequate height and extend deep enough into the tank to prevent fuel from sloshing into the filter.

Drain The Separator

A fuel/water separator blocks moisture, which collects in the sediment bowl. The bowl must be drained daily, or more often, to keep collected water from being sucked through the media. The operator simply opens the valve at the bottom of the separator to drain the water.

If the engine is not turned off first, the fuel system may draw air into the lines.



Source: Komatsu



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to be developed due to regulatory requirements and ever-increasing customer productivity expectations, each driving significant change," Springer says. "Therefore, there is an ongoing challenge to make sure the most current product information is communicated between the design engineers and the aftermarket serviceability consultants seamlessly, completely and timely."

Another problem, he says, is the number of new engineers that are coming into the work force. "There are a lot of them, so there are multiple challenges that have been in existence and will remain in existence for those reasons." Caterpillar has an increasing number of new engineers, he says, due to its growth and expansion into new markets. "This obviously gives our engineers new learning opportunities and, while it's an issue, we are prepared to meet today's challenges."



Diagnostic tools enable equipment managers to accurately identify problems and reduce no-fault-found rates.
Photo: Caterpillar

David Wolf, brand marketing manager at Case, also disagrees with IDC's conclusion that there is a growing gap. "We don't really see such a gap," he says. "Case has placed a huge emphasis on ease of maintenance and serviceability across all of its product lines. The incorporation of one-piece hoods that provide full access to the engine; ground line daily maintenance checks that require no tools; remote drains for fluid changes; and electronic service tools for quick, easy and accurate diagnostics. The involvement of service technicians in focus groups and new-product development discussions assist in minimizing the gap that is referenced."

Volvo uses SAE serviceability standards to compare design to design, Ross says. Serviceability targets are typically set ahead of the project, similar to product cost and quality targets. "In that way, it is very much in focus.

"However, in addition to serviceability targets, customer support representatives are always part of the design team and have a voice in the design aspects," Ross says. "Also, our customer-support teams tear down prototypes to determine better serviceability methods for the design cycle. We find the physical tear down is the most beneficial aspect of the design cycle from a servicing standpoint."

Ross says the technician issue lies more in the electronics side of things. "There are two basic issues here. First, the industry in general is finding a severe shortage of good, trained mechanics, which accentuates the problem. Second, as electronics continue to expand in products, the systems and diagnostic techniques need to become simpler to interface with. Mechanics today need to be well-trained in the use of various software and diagnostic tools. Simplifying this interface is a key issue."

"The unscheduled repair or failure require effective diagnostics," Hildebrand says. "The electronics today help provide more symptom information and error codes. However, the information still needs to be interpreted by the technician in order to apply the appropriate action."

Wolf says Case's goal is "to continuously improve product quality and use the best diagnostic tools available in the market. In fact, we see a generation of service technicians who are increasingly savvy and well-trained and increasingly skilled in the technology needed to do their jobs."

And at Volvo, Hildebrand comments, "construction-equipment quality is a result of field/application testing and the corrections implemented prior to production. Poor diagnostics and repair practices would be addressed through required, routine training and competency testing as done within the automotive industry."

Volvo's Ross says, "OEMs are making progress in this area. I believe the biggest benefit will come from better diagnostics and simplifying the interface between the machine and the mechanic."

Even so, says Barkai at IDC, fleet managers and technicians are challenged to keep up with the new technologies.

"The level of complexity and the level of knowledge of the industry required to maintain these complex systems is going much, much faster than the technician's ability to handle them."

Closing the engineering/designer and repair technician gap — perceived or otherwise — can be done, says Dave Markey, vice president, equipment services for American Infrastructure (see sidebar), but it will take teamwork and training at all levels. "This will take effort, and it is a cost," he says. "But with today's technician shortage, we must make attempts at doing more than we've done so far."



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By TOM BERG, Truck Editor



Tundra Double Cab: Not Big Enough?

Drive one and you'd probably say it's fine, but a larger one's on the way

TEST SET

Truck: Toyota Double Cab five-passenger 4x4 pickup, overall length 230.1 in., overall width 79.7 in., est. weight 5,025 lbs.

Engine: 4.7-liter i-Force V-8, 271 hp @ 5,400 rpm, 313 lbs.-ft. @ 3,400 rpm

Transmission: 4-speed automatic w/overdrive

Tires & wheels: 265/70R16 BF Goodrich Rugged Trail T/A on styled aluminum spokes

Wheelbase: 140.5 in.

Cargo capacity (including passengers and installed equipment): 1,462 lbs.

Towing capacity: 6,700 lbs.

Fuel capacity: 26.4 gallons

Tundra Double Cab is primarily a consumer product, but tradesmen and landscapers who don't carry or tow heavy loads could well put it to work. It's bigger than most pickup buyers seem to think, and it's made in America.

Toyota Motor Sales, U.S.A., has achieved lofty status among American automobile buyers, and its compact and now mid-size Tacoma pickups have proved wildly popular in some areas of the country. Customers testify to their vehicles' great build quality and long life, resale values are high, and the company leads the way in hybrid power-train technology. To the mainstream press, Toyota can do no wrong.

Then why hasn't it scored high with its full-size pickup trucks? Because size matters, and Toyota trucks haven't had enough of it. The T100, its first try, was mid-sized and lacked a V-8 engine. The Tundra is bigger, but still falls a little small. It's about 7/8 the size of pickups from America's Big Three manufacturers. Maybe, too, buyers don't perceive Toyota as a serious maker of big pickups; and let's face it, the competition fields some pretty nice trucks.

By year's end Toyota will begin producing a larger Tundra, one that's actually a bit bigger than current 1/2-ton full-size competitors — Ford's F-150 and 1500 series models from General Motors and Dodge (not to mention the Titan from Nissan). But is the current Tundra really too small? I actually like smaller pickups for my own use and appreciate the trim feeling of the current Tundra Access Cab, which is Toyota's answer to Ford's Super Cab, General Motors' Extended Cab, and Dodge's no-longer-offered Club Cab.

But there's no feeling of trimness with the long, four-door Double Cab. It feels every bit as big as a Ford F-150 Super Crew, for example, and is as much work to fit into a parking lot slot. If "big" is what American pickup buyers want, the Double Cab has it.

If "buy American" is a criterion among customers, even in these days of a World Economy, most might not know that the Tundra has always been assembled in the States, in Princeton, Ind., and now at a new plant in San Antonio, Texas. Most of its components are made in America, as well.

Commercial customers have not been high on Toyota's sales list, but it does offer the Tundra Regular Cab, a usually bare-bones truck with the base V-6 engine and an 8-foot-long bed. Toyota had one of these, with tool boxes and ready to work, on display at the National Truck Equipment Association's trade show in Atlanta this year, and NTEA members will give one away in a sweepstakes later this year.

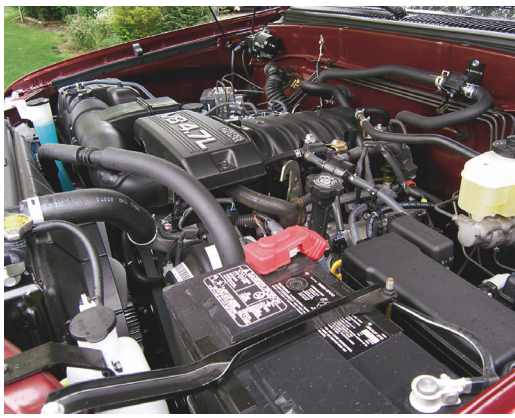
But Toyota says the Regular Cab is now out of production and its Detroit public-relations office didn't have one for me to drive. So I had to make do with the Double Cab you see here, and it wasn't bad duty. I used it for six days and drove it from Detroit to Milwaukee, then home to Westerville, Ohio, where I live.

To be sure, the Double Cab is primarily a personal or family vehicle, but it could double as a tradesman's or landscaper's truck. The latter would find the back seat useful for carrying workers to a job and towing a trailer that's not too heavy. There's room and seating inside for five big people, and the center console has convenient storage compartments and cup holders. Towing capacity is 6,700 pounds for the four-wheel-drive model.

The bed is 6 feet long, or 8 feet and beyond when the tailgate's folded down. There's a bit over 4 feet of space between the wheel wells, so you can easily haul the proverbial 4x8-foot sheet of plywood. This truck had a plastic liner and it narrows the width to almost exactly 4 feet between the wells. That means a 4-foot-wide piece of wallboard would be nicked unless you rest it on wood blocks or wedge 2x4s onto side supports along the two walls, then stack the wallboard on them.

Plastic liners protect a pickup bed's steel panels, and are slippery. That's fine if you've got to grab stuff and slide it out, like cardboard boxes or hay bales. But you have to tie down smooth objects to keep them from moving around, and dirt and moisture can work their way between the liner and the steel bed. So a spray-in liner or a rubber floor mat might be better ideas.

The TRD off-road suspension makes the truck sit high off the ground, aiding ground clearance for undercarriage parts. That's great if you get into rough terrain a lot, but few folks do. And meanwhile, you and your passengers have to climb into a cab whose floor sits two feet off the pavement. That's not the highest in the business, but it's a bother for shorter people. Running boards or nerf bars would help, and they're readily available from dealers or aftermarket suppliers.



Smallish by competitive standards, the 4.7-liter V-8 still makes more than enough power.

During almost 800 miles of driving, I used the four-wheel-drive system just once, to turn around by backing onto a sandy construction site. I really wouldn't have needed it, but I didn't want to spin any wheels and, besides,

The bed is 6 feet long with tailgate up and 8 feet (or more) with it down. Plastic liner insert cuts the width between wheel wells a bit, but it will still carry 4-foot-wide objects.



it demonstrated the ease with which the push-button controls work. The transfer case under the floor engages and disengages with just a hint of a click. Later I engaged it again on the lawn in front of my house; to get to 4W-Lo I had to first engage 4W-Hi, which I'd have known if I'd looked it up in the owner's manual. The manual is very complete, with 520 pages of information. It ranges from the usual recommendations for oil and tire pressures to changing bulbs in the head- and tail lights (not always an intuitive exercise and something seldom covered in such manuals).

The rear seats fold two ways and you can stow a lot of stuff back there. With SR5 trim, all seats, front and rear, were covered in a plain-looking but probably durable grey cloth, and were firmly padded. The bucket-type seats in front were not posh, but were very supportive. I spent the better part of three days on mid-western highways and never felt sore.

While driving, I found all gauges and switches easy to see and use, or did once I got accustomed to an odd mix of import- and American-style controls. For instance, cruise control is operated from a small stalk to the lower right of the steering wheel and windshield wipers are run from a longer stalk just above it; but the parking brake is set and released by a foot pedal near the far-left wall.

The 4.7-liter (287-cubic-inch) i-Force V-8 had plenty of power and I was always able to more than keep up with traffic. Then again, I have a light foot that comes from driving heavy trucks. Most folks want their pickups to accelerate like cars, and they think that they need a big-inch engine to do it. Toyota will accommodate them with a 5.7-liter V-8 in the upcoming Tundra, whether or not that turns out to be wise in this age of hefty gasoline prices.

As you'd expect with a 4x4, the ride was stiff but smooth if the pavement was. On broken concrete the ride was jouncy, though not enough to loosen any tooth fillings. Brakes were adequate, but I had to really push the pedal for short stops and the pads seemed sticky as the truck approached a standstill. This, along with the space and work needed to maneuver the truck in tight quarters, makes me wonder why folks would like it, or any full-size crew-cab pickup, for personal use. Those who do are quick to praise the high-up view of traffic and the general feeling of safety and power.

There's a price to be paid in fuel economy, however. I got 15 to 17 miles per gallon in city and highway driving. But if there are things to be hauled, especially dirty or outsized objects that commercial users or suburban homeowners sometimes must contend with, there's nothing like a pickup to tote the load. For me, the Double Cab is more than big enough; Toyota fans who think it's just right have six or so months to go out and grab a new one.



SR5 interior is plain but functional. Controls are an odd mix of import and domestic styles.



Big doors open to a roomy interior. Rear seatbacks fold down (as shown) or complete seat folds forward for more cargo space.

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By WALT MOORE, Senior Editor

Motor-Grader Technology Hits High Gear

Today's motor-grader market offers more choice and more technically advanced machines than ever before

Although Caterpillar did intensive preparatory homework, we'd still bet that you could have almost heard the company take a corporate deep breath just before deciding to design its new M-Series motor graders without conventional controls, that is, less the two banks of control levers that flank the steering wheel — and, yes, less even the steering wheel. Replacing all those familiar controls are but two multi-function joysticks. Caterpillar's big news, however, is only the most recent in a string of major announcements regarding motor-grader refinement and new-model introductions. Motor-grader manufacturers have been busy.

In April, for example, Volvo officially introduced its seven new G900-Series machines, which reflect an absolutely new design, compared to their B-Series predecessors, and feature an industry first — an optional 11-speed transmission. And earlier this year, Terex added four torque-converter-drive motor graders to its product mix. Then, going back little more than a year, Deere replaced its C-Series range with significantly redesigned D-Series machines, including two new models larger than any the company has yet offered.

Preceding all this activity was Komatsu's introduction of its Laterra Series, which features machines that have both a torque-converter-drive mode and a direct-drive mode. Other significant motor-grader news in the past 24 months or so has included LeeBoy's introduction of its largest machine ever, the 25,000-pound 785, Champion's redesign of its C80C and C86C, plus Huber's refinement of its Maintainer into the new D-Series M-850. By our reckoning, not counting Caterpillar's H-Series models (some of which will remain available until mid-2007), motor-grader buyers now have more than 60 model choices in today's market.

This resurgence in motor-grader design



Heavy-duty designs that feature six-wheel drive, variable-horsepower engines and robust moldboard systems allow today's large motor graders to take on the tough jobs, yet to fine-grade with exacting precision.

Want Joystick Control in Your Motor Grader?

According to Maddock Industries, its GraderStick, a single joystick controller that handles up to nine functions, can be installed without disabling or altering a motor grader's conventional controls. The GraderStick package includes the joystick handle, electronic processor, electro-hydraulic valve assembly, hose kit and wiring harness. Installation requires about eight hours, says the company, and list price for the installed system is around $15,000.



refinement may have received impetus from the market turnaround that took hold in 2004. After a down cycle that lasted for the best part of five years, sales numbers began to climb that year — and are now projected to grow moderately for the next several years from the current annual global-market total of 7,000 to 8,000 units. North America remains the largest market for motor graders, consuming about half the annual total.

Power-train refinement

When preparing the specification chart for this report, we noted with interest the variation in drive-train design reflected in today's motor graders, namely, the use of hydrostatic transmissions, direct-drive powershift transmissions, and powershift transmissions with torque converters.

What the specifications show is that machines on the small end of the weight scale are generally hydrostatically driven, the largest hydrostatics being the PSI MG618 and MG622 models, which weigh in at about 18,500 and 23,000 pounds, respectively. But not all smaller units are hydrostatic. The Noram 65E Turbo, for instance, at 16,800 pounds and 110 horsepower, uses a powershift transmission with a torque converter.

Although hydrostatic drive may be the most cost-effective design for smaller units, manufacturers using the technology say that the drive system provides exceptional low-speed performance and control, compared with controlling a powershift transmission with an inching pedal and brake.

According to the chart, 15 models use hydrostatic drive, 31 use a direct-drive powershift, and another 15 use a powershift in conjunction with a torque converter. According to Komatsu, its Laterra Series models, in the four lower gears, provide either torque-converter-drive or direct-drive (when the converter is locked). This system, says the company, takes into account that one or the other of the drive modes may yield better performance in a given situation.

Direct-drive systems, however, are becoming friendlier, as evidenced by the new Deere, Volvo and Caterpillar transmission systems that allow directional changes without using the inching pedal. Many direct-drive powershift systems also incorporate an "auto-shift" feature, which relieves the operator of tiresome shifting in operations that require going up and down through the gears. And Volvo, with its optional 11-speed powershift, makes the point that smaller steps between gears allows the operator to more easily find the most efficient torque/speed combination for a given situation.

Front-wheel-assist systems also are becoming friendlier, in terms of allowing the operator more control. Deere's D-Series system, for instance, allows the operator (as do other systems) to dial in how aggressively the front wheels pull, and it also allows the operator to adjust the inching-pedal mode to either engage the front wheels simultaneously with the tandem, or to delay engagement until the tandem has taken hold. The Cat M-Series models and the Volvo G900-Series models that are equipped with all-wheel drive feature a front-wheel-drive-only mode for use in situations requiring precise control.

And to complement drive-train refinement, the variable-horsepower feature, available with engines in certain motor-grader models, also is being refined. According to manufacturers offering the variable-horsepower feature, its purpose is to provide custom power and torque curves for certain gears or gear groups in order to more effectively match machine performance to the application. For example, Volvo's new system provides three power ranges and uses a speed/power switch to limit maximum rpm in the two lower ranges. Caterpillar's new variable-horsepower system, standard on the M-Series, delivers additional horsepower in 5-hp increments as transmission gear selection increases.

More control, easy service

Generalizing about the implement hydraulic systems on today's motor graders, we'd say that more systems are being designed to provide enhanced efficiency, better multi-function operation and reduced hydraulic effort at the control levers — the latter benefit also complemented by levers that may be closer to-

Motor-Grader Specifications

	Max. HP (net)	Weight (lb.)	Trans. Type*	Speeds** Fwd/Rev
Basic Equipment				
601	49.5	7,300	H	2/2
Case				
845	140	29,777	P	8/4
865	169	32,077	P	8/4
865DHP	190	32,077	P	8/4
885	205	37,950	P	8/4
Caterpillar* **				
120M	160	30,640	P	8/6
12M	180	31,895	P	8/6
140M	200	33,235	P	8/6
160M	230	35,030	P	8/6
14M	280	46,930	P	8/6
16M	320	57,510	P	8/6
24M	510	137,695	P/TC	6/3
120H	140	27,880	P	8/8
135H	155	28,840	P	8/8
12H	185	31,320	P	8/8
140H	205	32,360	P	8/8
143H	205	33,670	P	8/8
160H	220	34,560	P	8/8
163H	220	35,890	P	8/8
14H	240	41,010	P	8/8
16H	285	54,350	P	8/8
24H	500	136,610	P/TC	6/3
Champion				
C60B	80	12,800	H	2/2
C66B	80	13,400	H	2/2
C70B	80	13,050	H	2/2
C80C	80	15,000	H	2/2
C86C	110	15,500	H	2/2
Changlin				
PY165H	165	31,526	P/TC	6/3
PY190H	190	33,069	P/TC	6/3
PY220H	220	34,172	P/TC	6/3
Deere				
670D	185	32,010	P	8/8
672D	185	33,630	P	8/8
770D	215	32,670	P	8/8
772D	230	34,280	P	8/8
870D	235	34,750	P	8/8
872D	245	36,210	P	8/8
Flannegan Western				
Model FW	65	6,000	H	2/2
Huber				
M-850-D	80	9,380	H	2/2
Intensus				
GR180	180	33,951	P	6/3
GR215	215	37,478	P	6/3
Komatsu				
GD555-3	140	30,950	P/TC	8/4
GD555-3 VHP	160	30,950	P/TC	8/4
GD655-3	165	33,069	P/TC	8/4
GD655-3 VHP	190	33,069	P/TC	8/4
GD675-3	180	34,854	P/TC	8/4
GD675-3 VHP	200	34,854	P/TC	8/4
GD825A-2E	280	58,250	P/TC	8/8
LeeBoy				
635	47	6,750	H	2/2
685B	110	15,200	H	2/2
785	130	25,300	P	6/3
New Holland				
G140	140	29,777	P	8/4
G170	170	32,077	P	8/4
G170 VHP	200	32,077	P	8/4
G200	200	37,950	P	8/4
NorAm				
65E Turbo	110	16,800	P/TC	6/3
PSI				
M406XT	65	6,850	H	2/2
M413	133	12,650	H	2/2
M413XT	133	13,220	H	2/2
MG618	133	18,590	H	2/2
MG622	133	22,840	H	2/2
Terex				
TG110`	132	25,353	P/TC	6/3
TG150	163	31,967	P/TC	6/3
TG190	176	41,226	P/TC	6/3
TG210	229	46,297	P/TC	6/3
Volvo****				
G930	195	34,300	P	8/4—11/6
G940	215	35,200	P	8/4—11/6
G946	235	36,700	P	8/4—11/6
G960	235	36,800	P	8/4—11/6
G970	250	39,900	P	8/4—11/6
G976	265	40,500	P	8/4—11/6
G990	265	46,300	P	8/4—11/6

*P = Powershift
H = Hydrostatic
P/TC = Powershift w/ torque converter

**Speed ranges for hydrostatics

***Caterpillar's new 14M will be available 4th Quarter, 2006. Subsequent M-Series models likely will be available in 1st and 2nd Quarters, 2007.

****Volvo offers both an 8-speed and an 11-speed powershift transmission.



Indicative of today's easier-to-service machines, this Deere grader features circle wear inserts (alloy or nylon) that are designed for replacement in about two hours using only a 9/16-inch wrench.

gether and have shorter throws than previous designs. To gain these advantages, some larger machines are now using pressure-compensated/load-sensing systems that incorporate variable-displacement pumps.

Although these variable-flow systems are extremely efficient, there's always a danger in touting their advantages, lest simpler systems be perceived as inferior. That's not the intent here (nor the truth), because constant-flow systems also have been refined for greater efficiency and controllability, and in some instances are the most cost-effective choice for smaller machines.

Another focus of today's motor-grader design is the geometry of the moldboard and draft frame. By adjusting the angles at the moldboard's cutting edge and at its top radius, for example, material entering the blade can be made to start rolling sooner and to encounter less resistance as it moves up and across the blade. Less resistance means that the grader moves more smoothly through the cut and uses less horsepower (and less fuel) in the process. Among draft-frame changes, some manufacturers have adjusted this component upward, thus increasing the free space between the top of the moldboard and the bottom of the circle to minimize plugging in sticky material.

Another basic observation about today's graders is their enhanced serviceability. This includes everything from advanced electronic diagnostic systems, to centralized lubrication banks, to ground level, one-side access to routine service points.

But of special note are new systems for maintaining the adjustment of the draft frame, circle and moldboard. In some instances, for example, moldboard shims have been eliminated, and in other systems, easy access to circle wear inserts allows changing these components in a couple of hours. As more motor graders are fitted with automated grade-control systems, of course, keeping the moldboard and its related support systems in adjustment has become critical.

And one final thought that brings us full circle to the use of joystick controllers. Reliable market intelligence tells us that at least one other motor-grader manufacturer has prototype machines running with joysticks. But, all you seasoned operators can relax. Motor graders are still best operated by experienced hands, whether those hands are gripping joysticks or conventional controls.

Average List Prices and Hourly Rates

HP Range	List Price	Hourly Rate*
74 & less	$63,000	$32.18
75-114	$92,897	$40.58
115-129	$178,622	$50.03
130-144	$185,576	$51.30
145-169	$241,258	$63.20
170-199	$257,245	$69.18
200-249	$299,498	$79.49
250 & more	$465,178	$124.83

* Hourly rate equals monthly rate divided by 176, plus operating cost. Unit prices include: fuel @ $2.49 per gallon; mechanic's wage @ $40.18 per hour; and cost of money @ 5.125 percent.
Source: www.EquipmentWatch.com, 800-669-3282

Web Resources

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CHAMPION

Compact Line Serves Diverse Buyers

According to Champion, its C60B and C66B are designed as "maintainer" machines, and the C70B is aimed at more cost-conscious buyers. The recently redesigned C80C and C86C, however, are full-featured compact machines that "think like big graders," says Champion.

Number of models: 5

New models: C80C and C86C

Product-line features: The tandem-drive C80C and the six-wheel-drive C86C are articulating, hydrostatically driven, Cummins-powered models that feature a heavy-duty front axle using spherical bearings and providing 50 degrees of steering angle (left and right). The 21-inch-tall moldboard is designed to minimize spillover and to allow ample adjustment, while the 4-foot blade-lift-stance is aimed at enhancing blade control.

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JOHN DEERE

Recent Design Overhaul

Deere's new D-Series range of motor graders, introduced a bit more than a year ago, reflect significant design enhancements compared to their C-Series counterparts. New to the Deere range with the D-Series are the six-wheel-drive 872D and its tandem-drive companion model, the 870D. The standard cab for the D-Series is a low-profile design, but a full-height or "tall" cab is optionally available.

Number of models: 6

New models: 670D, 672D, 770D, 772D, 870D and 872D

Product-line features: In addition to new emissions-compliant engines, the D-Series features redesigned moldboard and draft-frame geometry, new pressure-compensated/load-sensing hydraulic system, new cab and new transmission-control system (Event-Based Shifting). The new shift-control system electronically senses load and speed parameters, and then determines optimum engagement/disengagement rates for hydraulic clutches to promote smooth shifts. Operational directional changes can be made without the inching pedal.

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Photo: George Pfoertner®

CASE

Floor-to-Ceiling Glass

According to Case, the operator's environment of its 800-Series motor graders provides optimum comfort and convenience. With 85 square feet of floor-to-ceiling glass, the cabs are designed to provide all-around visibility, plus the cabs are secured with an "Isomount" system that is designed to reduce noise and vibration. In addition, the cabs are located on the frame to provide clear sight lines to the moldboard and tires for precise blade positioning.

Number of models: 4

Product-line features: Case graders feature six-cylinder Cummins diesel engines, with the dual-horsepower 865DHP using the Cummins QSB5.9. All use direct-drive powershift transmissions with an inching pedal, and the 8F/4R transmission can be shifted manually or turned over to an automatic system. Optional extensions allow adding two feet to each end of the moldboard, and a five-position saddle can tilt the blade to 90 degrees.

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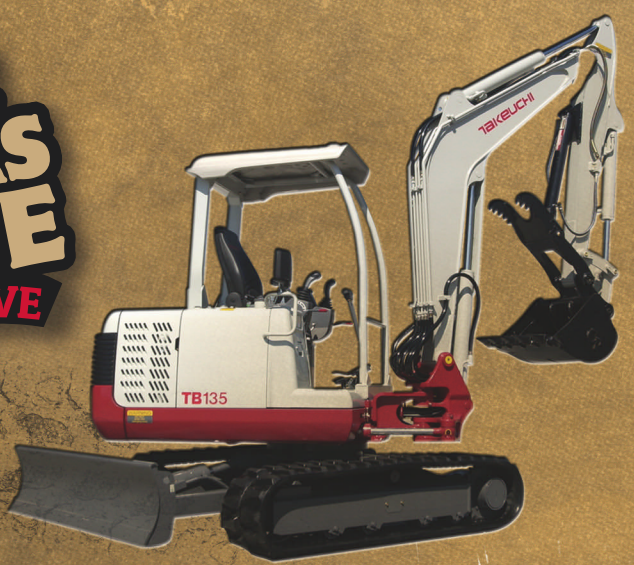



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PSI

Conventional and Tool-Carrier Models

PSI's (Pavement Services Inc.) motor-grader line-up includes five models, ranging from the 6,800-pound M406XT to the 22,800-pound MG622. The company's XT models are "tool carriers" that are fitted with universal-type couplers and auxiliary hydraulics to accept suitable skid-steer-loader attachments.

Number of models: 5

New model: M406XT

Product-line features: All PSI motor graders are fitted with Deutz diesel engines and feature a two-speed hydrostatic drive system with an electronic traction-control feature. The rigid-frame M406XT, M413 and M413XT are two axle (four wheel) machines with all-wheel drive. The larger articulated-frame models are tandem-drive types with available front-wheel assist.

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TEREX

Three Options for Front Wheels

The brand-new, four-model range of Terex motor graders features three choices for the configuration of the front axle: T version — non-driven with wheel lean; TA-1 — driven without wheel lean; and TA-2 — driven with wheel lean. According to Terex, these new models feature 90-degree blade positioning on both sides and have a 30-degree articulating frame.

Number of models: 4

New models: TG110, TG150, TG190 AND TG210

Product-line features: The new Terex models are all Cummins powered and use a 6F/3R "auto" powershift transmission with a torque converter. The front wheels, if powered, are driven via a hydrostatic system. Additional work tools include a ripper mounted between the front axle and moldboard and a front dozer blade, either articulated or removable.

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HUBER

Six Machines in One

According to Huber, its Maintainer can easily become six machines: motor grader, bulldozer, loader, scarifier, side dozer and berm leveler. In its motor-grader configuration, the Maintainer uses a 9-foot moldboard (13.5 inches tall) with dual angle-control cylinders and a 19-inch power side-shift feature.

Number of models: 1

New models: M-850-D

Product-line features: The Huber Maintainer is Cummins powered and hydrostatically driven, providing travel speeds to 16 mph. An optional 10-foot moldboard is available and a gear pump producing a flow of 21.5 gpm supplies the implement hydraulic system.

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CATERPILLAR

Is Something Missing Here?

If you haven't yet heard, Caterpillar's new M-Series motor graders replace the conventional motor grader's steering wheel and multiple control levers with two multi-function, three-axis joysticks. These controls in its new seven-model M-Series range, says the company, can reduce operator hand and arm movement by as much as 78 percent. M-Series models will replace the 10-model H-Series range, beginning in October 2006 and continuing through mid-year 2007.

Number of models: 7

New models: 120M, 12M, 140M, 160M, 14M, 16M and 24M

Product-line features: The M-Series design goes beyond the new joystick controllers to include the company's ACERT engines, new direct-drive countershaft transmissions with electronic clutch-pressure control (except the 24M), modular rear axle and a new hydrostatic front-wheel-drive system (120M, 140M and 160M). Variable horsepower is standard on the M-Series, and a new power-management system delivers horsepower in increments of five as transmission gear ranges step higher. A new system for maintaining adjustment of the drawbar, circle and moldboard makes this chore much easier, says Cat.

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NORAM

"Features Beyond Its Size"

That's how NorAm promotes its 65E Turbo motor grader which, says the company, "is a compact grader with full-size-grader features built in." NorAm was formed in 1992, but its product's heritage stretches back more than 50 years to the first Allis Chalmers Model D motor grader. Under NorAm's watch, the already steadily refined former Fiatallis machine has undergone several major design overhauls, the most recent in 2005. NorAm dealer locations number more than 100.

Number of models: 1

Product-line features: The 65E Turbo features Cummins diesel power (QSB4.5T), ZF transmission technology (WG115) and a torque-proportioning rear differential. The ZF transmission is a full powershift with integral torque converter and electronic (6F/2R) shift control. The 53-inch, gear-driven circle provides 360 degrees of blade rotation, and the "A-frame" drawbar incorporates four contact points for optimum blade adjustment. The machine is available with an air-conditioned cab, optional 12-foot moldboard, front scarifier, dozer blade and rear ripper.

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LEEBOY

Choose Compact or Production Models

LeeBoy's three-model range of motor graders includes two smaller, hydrostatically driven units — the 6,700-pound 635 and the 15,000-pound 685B — and a larger model, the 785, which weighs in at 25,000 pounds.

Number of models: 3

Product-line features: The 130-hp model 785, introduced in 2004, extends the LeeBoy line into the range of production graders. A 130-hp Cummins diesel engine and a Clark 6F/3R powershift transmission drive the 785's geared tandem (no chains). This largest LeeBoy has 20 degrees of frame articulation and 60 inches of blade shift.

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FLANNEGAN WESTERN

Compact and Easy to Transport

Flannegan Western literature shows its new FW motor grader neatly secured on an 18-foot trailer with a rated GVWR capacity of 12,000 pounds. According to the company, this 6,000-pound motor grader, which was introduced earlier this year, is easy to transport.

Number of models: 1

New models: FW motor grader

Product-line features: The FW motor grader is hydrostatically driven and provides two speed ranges in forward and reverse. The unit incorporates a 65-hp, turbocharged John Deere engine.

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VOLVO

Exclusive 11-Speed Transmission

The seven models in Volvo's new G900 motor-grader line can be equipped with the Volvo-designed HTE840 8F/4R transmission with selectable manual, "autoshift" (optional) and travel modes, or with the company's new 11F/6R HTE1160 transmission with standard autoshift. The optional new 11-speed, says Volvo, allows more control at low speed, more efficient travel at high speeds, and more precision in normal working ranges. A shuttle-shift feature allows shifting between selected forward and reverse gears without using the inching pedal.

Number of models: 7

New models: G930, G940, G946, G960, G970, G976 and G990

Product-line features: The four smallest of Volvo's new motor graders use the company's 7.2-liter Volvo D7 engine, and the three larger models use the 9.4-liter Volvo D-9. These engines are Tier-3-compliant and utilize Volvo's Advanced Combustion Technology (V-ACT). All seven models have three power ranges, depending on the transmission gear selected. These new graders also incorporate Volvo's Proportional Demand Flow hydraulic system and a twin-gear, direct-drive circle-turn system. The two six-wheel-drive models, the G946 and G976, have a front-wheel-drive-only (Creep) mode.

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KOMATSU

Direct-Drive and Torque-Converter Modes

The drive train in Komatsu's Laterra Series motor graders allows the operator to choose a torque-converter mode, or to lock up the converter and use the machine in a direct-drive mode with an inching pedal. According to Komatsu, the torque-converter mode, available in the four lower gears, provides increased tractive effort and finer low-speed control.



Number of models: 7

Product-line features: Komatsu motor graders feature electronically controlled, 8F/4R powershift transmissions (the GD825A-2E has eight reverse speeds) that provide travel speeds to 26.2 mph (27.9 for the GD825A-2E). The implement hydraulic system is a load-sensing, closed-center type using a variable-displacement pump and Komatsu-designed and built valves.

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Gallery of Motor Graders



NEW HOLLAND

Operator Comfort and Convenience

New Holland makes the point that large cabs for its motor-grader range are available in both low-profile and high-profile configurations to suit operator preferences. Large glass areas in both cab styles are designed to provide all-around good visibility, and provisions for sound and vibration reduction are aimed at minimizing distractions and fatigue. Operator convenience also extends to the details, says the company, such as the "bump-type" transmission controller that reduces effort for the operator.

Number of models: 4

Product-line features: New Holland motors graders all use Cummins diesel engines and direct-drive, 8F/4R powershift transmissions that yield a top forward speed of 26.5 mph. All feature a large-diameter circle (69 inches) and provide optional moldboards.

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CHANGLIN

More Choices for Canada

The three-model Changlin motor-grader range is, currently, marketed only in Canada, but availability in the U.S. market is a future possibility.



Number of models: 3

Product-line features: Among the three Changlin models, the smallest and largest (PY-165H and PY-220H) use Shanghai diesel engines, while the 190-hp PY-190H is fitted with the Cummins 6CTAA8.3-C185. All models are equipped with a ZF WG180 powershift transmission (6F/3R) with an integral torque converter.

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BASIC EQUIPMENT

Loader System Uses Attachments

Basic Equipment's model 601 is a hydrostatically driven, articulating motor grader that can be fitted with an optional Loader System, which provides 9.5 feet of lift height and features a universal-type coupler and a 12-gpm auxiliary hydraulic system. According to the company, a number of skid-steer-loader attachments can be used with the coupler.

Number of models: 1

Product-line features: The 601's water-cooled Kubota diesel engine, rated at 49.5-horsepower, powers its four-wheel-drive, two-speed hydrostatic propel system. This 7,300-pound machine uses a moldboard that side-shifts 24 inches and angles 40 degrees left or right from center.

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INTENSUS

Cummins Power and Six-Speed Powershift

Two Intensus motor-grader models, the 180-hp GR180 and the 215-hp GR215, both use a Cummins engine and a 6F/3R ZF powershift transmission. The fully enclosed, high-visibility cab is standard equipment, and air conditioning is available.

Number of models: 2

Product-line features: The tandem-drive Intensus graders are articulated and feature replaceable nylon wear strips in the 360-degree-rotation circle. Separate hydraulic systems are used for the steering and implement circuits, with the latter employing a duplex gear pump.

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Concrete Products

BOBCAT

The Bobcat concrete pump attachment is designed for working in confined spaces. According to Bobcat, either side of the pump can be attached to the loader for best positioning. Depending on delivery-hose length and diameter, slump of the concrete, aggregate size and additives used, the pump attachment can move concrete as far as 250 feet horizontally, or up to two stories vertically. If driven by a loader with a high-flow auxiliary hydraulic system, the pump can deliver up to 28 cubic yards per hour.

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GOMACO

The Commander III curb-and-gutter machine, featuring GOMACO's G21 digital operating system, is designed for slipforming such structures as curbs and gutters, monolithic sidewalks, barrier walls, bridge parapets, irrigation canals, and 20-foot-wide slabs. Its All-Track-Steering system gives the machine added maneuverability, and its All-Track Positioning system (with each leg individually adjustable) provides more latitude for accommodating jobsite obstacles.

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ATLAS COPCO

Atlas Copco Construction Tools' SB hydraulic breaker attachments are designed with a compact shape to facilitate working in confined spaces. New in the line are the 183-pound SB 100 and 275-pound SB 150, designed for use on smaller carriers. Maximum impact frequency is 2,280 blows per minute, and both new breakers operate in a pressure range of 1,450 to 2,175 psi. The SB 100 requires an oil flow of 4.2 to 9.2 gpm, and the SB 150 requires 6.6 to 10.6 gpm.

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MULTIQUIP

Two walk-behind power trowels from Multiquip's Whiteman division, the 8-hp BA-4-8H and the 5.5-hp JA-45H, have four blades and ring diameters of 46 and 36 inches, respectively. If the trowels are equipped with optional QuickPitch handle, the operator can raise or lower blade pitch in 1/8-inch increments. A new throttle-control system allows speed to be set with a twist of the wrist. The new machines are available with Honda, Robin or Briggs & Stratton engines, or with an electric motor.

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TEREX

Terex Roadbuilding's B-Series SF-2204B HVW (hydraulic variable width) concrete slipform paver is designed with a 48-inch pan profile length and features two-speed, variable-displacement drive motors to provide travel speeds to 90 feet per minute. The machine is available with an optional 2-foot extension kit for 22-foot-wide placements.

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POWER CURBERS

Using a 133-hp engine, the 5700 SUPER-B is capable of high production in curb-and-gutter applications, says the company. Design enhancements include a raised operator's platform to increase visibility; a hydrostatic, direct-drive conveyor; heavy crawler frame; rotary controls that allow fractional adjustments to ground speed and conveyor speed; and externally mounted coolers for the engine and hydraulic system. The enclosed auger holds sufficient material to pour a tight radius without repositioning the truck.

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LIEBHERR

Liebherr Concrete Technology's new LDP Concrete Reclaimer Buffer allows as much as 12 cubic yards of "buffering capacity" when returning transit mixers are discharging excess material into an existing concrete-reclaiming system. As many as six transit mixers can discharge simultaneously into the buffer, which remixes the material with added water to maintain acceptable slump. An added advantage with the buffer, says Liebherr, is that material flow into the reclaimer is more uniform.

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PUTZMEISTER

With a vertical reach of 138 feet 5 inches using a five-section boom in a Z-folding configuration, the Putzmeister 43Z concrete boom pump features a 5-inch delivery line. The new machine has a compact outrigger spread of 26 feet 1 inch in front and 29 feet 6 inches at the rear. Front outriggers telescope out diagonally, while the rear swings out to facilitate setup when space is restricted.

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By MIKE VORSTER, Contributing Editor

Equipment Executive Top 10 List

Execute the following strategies correctly, and you and your company should enjoy substantial success

We've covered a lot of ground since launching this column 36 months ago, so as our present to our readers, here's a top 10 list of things you need to do right.

We've covered these topics in previous articles, all available at the Equipment Executive section of ConstructionEquipment.com, so feel free to review the details online. And plan to attend our next Construction Equipment Institute on Jan. 16-19, 2007.

Buy right. It starts with having the right iron. You are making a long-term investment in assets, so take the selection decision seriously. Don't buy because the deal is too good to resist, and remember that dealer support is more important than low first cost.

Equipment works hard and success depends on your ability to keep the machine producing completed construction on time and on budget. To do this, the machine must have the quality and capability needed to produce work all day, every day.

You must also have the expertise needed to keep it up and running regardless of where it may be working. Every machine will break; the speed, efficiency and cost of returning it to service will determine the success of your selection decision.

Develop your operators. Operators are your first line of defense. No one is more important when it comes to determining the operating cost and productivity of your fleet, yet operators are frequently outside the equipment manager's sphere of influence. Even so, be committed to their training and development.

Manufacturers continue to improve the reliability and capability of equipment, and more skill is being demanded of our operators. We cannot waste these efforts by constantly switching operators from machine to machine, having operators who are not fully trained, and unable to balance the need for productivity with the need to look after the machine.

You will show that you care about your equipment and your operators if you emphasize operator development, give them a sense of ownership in the equipment they operate, and understand the value of their role in productivity and cost.

Maintain without compromise. Preventive maintenance is an investment rather than a cost, and systems that ensure that it is done to the required quality standards on time every time are not negotiable. The field technicians visit the machines regularly and must have the time, training and tools needed to inspect and report; they cannot just check, change, adjust and lubricate.

Mechanical maintenance focuses on repair before failure and bridges the gap between preventive maintenance and repair. It keeps you in control of the timing and the extent of the work to be done and reduces cost without sacrificing reliability. An effective program depends on an ability to predict failure and use data rather than conservative guesses.

Manage costs by category. It is good to know that actual costs are exceeding budgeted costs, but it is unlikely that you will be able to take appropriate action unless you know which cost category is causing the problem. Therefore, divide both actual and budgeted costs into an appropriate number of categories to manage cost by category.

Owning and operating costs must be counted together any time we consider the total cost of a machine, but we will do a better job if we measure actual versus budget for each category and manage them independently. Owning costs are mostly fixed, and the hourly rate is dependant on annual utili-



Mike Vorster

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

"You must have the courage to act when you believe the time is right rather than wait until an unplanned failure demands your no-option immediate reaction to a crisis."

zation. Operating costs are proportional to the number of hours worked, and the hourly rate depends on the age and application of the machine as well as the effectiveness of maintain, repair and rebuild decisions. Actionable cost information can only be provided if these two categories and their appropriate subcategories are budgeted and managed separately.

Know that repair costs will increase. Repair costs will increase as a machine ages, yet we budget and manage them as if they will remain constant. This causes two problems. First, young machines underrun their repair cost budget, and we falsely believe they are "making money." Second, older machines over-run their budget, and we falsely see this as a cause for concern rather than a predictable part of total lifecycle cost.

Establishing repair budgets for each third of a machine's life improves budgeting and helps to identify machines that are exceeding budgeted repair costs.

Understand depreciation. Tax calculations are performed with only one objective in mind (to establish a basis for calculating tax due), and each step in the process is defined by tax codes. The only real measure for the actual depreciation experienced when putting a machine to work is provided by the used equipment market.

If you want your depreciation estimates as close to "right" as possible, then you must base them on your knowledge of the market and not on numbers provided by the administrators who write and amend the tax codes.

Measure inputs and outputs. We are really good at measuring money, the prime input, but we struggle to measure outputs such as availability, uptime and reliability. We need to know whether increasing expenditure on repair and maintenance is producing the desired results, or whether we are simply throwing good money after bad.

Measuring both inputs and outputs enables us to focus on the efficiency of our processes and often shows how wrong it is to buy low, pinch pennies, and focus on cost reduction without regard to uptime, reliability and productivity.

Buy what you burn. If a machine lasts 16,000 hours and you run eight of them for 2,000 hours a year, you will have to replace or rebuild hours equivalent to one new machine per year. It is not complicated, but it requires discipline and an acceptance of the fact that you must constantly invest in your fleet if you wish to maintain your productive capacity.

Buying what you burn means that you are not living off your seed corn, that you are reinvesting the cash flows recovered through depreciation, and that you have a long-term strategy in place. A steady systematic fleet-investment program maintains fleet average age and solves many of the problems associated with out-of-balance repair costs and lumpy depreciation schedules.

Focus on functions. Equipment managers can become so focused on equipment that they lose sight of the fact that construction companies succeed by bidding competitively and producing safe, quality work. Equipment management is not "the business," and empires or corporate organizations that focus on internal scorekeeping and politics rather than the real business of making money won't survive.

Focusing on and understanding six basic functions will build success. We need to 1) buy and sell equipment for the best price possible; 2) ensure that it is licensed, inspected and legal; 3) move it from job to job and have it in the right place at the right time; 4) keep it up and running through effective field maintenance; 5) run efficient repair facilities, shops and yards; and 6) manage the fleet to maximize its value as an corporate asset.

Focusing on these six things, managing each and measuring outcomes, will ensure our success.

Play the game, add value. There are two approaches to defining the role of the equipment manager. The first sees equipment management as synonymous with "shop management" and considers the equipment manager's primary function to supply equipment as and when needed. Broad and important issues such as making sure that the fleet supports current operational plans go unattended. There is no overarching responsibility to manage the fleet as a corporate asset.

The other approach defines equipment management as an executive function that provides expertise, integrates decisions, provides information, and looks after the fleet from cradle to grave. The equipment manager is a member of the executive team, is involved in strategic decision making, supports policy at all levels in the organization, and manages the fleet on a fully informed proactive basis.

Which approach applies depends on the value you add to the company. Be constructive, be proactive, rejoice in your expertise, and constantly seek out new ways to play the game.

These 10 strategies will make you and your company better. We won't stop here, though. Our fourth year starts next month. CE

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By WALT MOORE, Senior Editor

RapidLink Expands Utility Of New "Utility" Vehicle

This new Bobcat model can handle five front-mounted attachments at the moment, and more are on the way



The attachment system for the 2300 appears to be robust in design and construction.

In the crowded utility-vehicle market, Bobcat has managed to achieve a measure of product differentiation for its model 2300. The new model stands apart from the crowd by virtue of its RapidLink attachment system, which is a front-mounted, hydraulically operated, joystick-controlled coupler that permits this four-wheel driver to handle a bucket, pallet forks, push broom, snow blade and mower.

According to product manager Brad Claus, more attachments will be forthcoming. The RapidLink system's attachment arm can lift loads as heavy as 500 pounds to heights of 2 feet. When not required, the system can be removed, allowing the 2300 to go about more conventional chores.



Not to be confused with a production wheel loader, the 2300 nevertheless can handle a sizeable bucket, and the joystick controller is a plus.

The 2300 features a 20-hp diesel engine, as well as the Bobcat IntelliTrak four-wheel-drive system, which automatically sends power to all four wheels and protects against traction loss, says Bobcat, by "preventing one, two or three wheels from spinning without the fourth." The automatic locking differential engages when needed, says the company, but disengages when turning to minimize ground disturbance and wear to tires and drive components. The 2300's deep-ratio, continuously variable transmission relieves the driver from shifting and is designed to provide high torque and travel speeds to 25 mph.

For the driver, the 2300's rack-and-pinion steering system is designed to provide low-effort turning with a quick ratio, and the design of the wheel-cut angle affords a short turning radius. Double A-arm front suspension and swing-arm rear suspension is aimed at smoothing the ride, and an adjustable steering column and adjustable seat help place the driver in the comfort zone. A 12-volt power adapter is on the dash if you need it, and cup holders, which no doubt you will definitely need, are standard equipment.

And to provide support for all of this comfort and technology is the 2300's aluminum frame which, says Bobcat, was chosen for its rust-resistance, strength and durability. The new frame also supports an 800-pound-capacity, power-dump bed. For added towing and rear-attachment capability, the new model also provides a standard 2-inch receiver hitch.

We had the recent opportunity to take the 2300 through a pretty serious rough-terrain obstacle course at a Bobcat press event. We were left with the impression that this new utility vehicle was essentially unconcerned about steep grades, wheel-swallowing potholes and tight turns that sometimes left a wheel catching air. And we were taken, too, with its adept handling of a bucket and forks. List price for the 2300 is around $15,000, and the attachments range in price from about $350 to $2,250.

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CEI

Don't miss it!

January 16-19, 2007

What is CEI?

The Construction Equipment Institute is a highly specialized management-development program designed for individuals who manage fleets of heavy equipment in the construction, mining, and quarrying industries. Group work, presentations by industry experts, and panel discussions comprise this highly interactive four-day course.

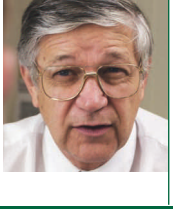
Who should attend

- Equipment Managers responsible for the operational, planning, and policy decisions that affect the cost, reliability, and performance of equipment fleets.
- Operations Managers in the construction, mining and quarrying industries who seek a better understand of techniques to reduce equipment ownership and operating costs and improve productivity.
- Fleet Owners who are seeking to maximize their return on assets as well as improve the productivity of their fleet.

Learn to:

- Develop budgets and business plans for equipment operations
- Evaluate some of the leading equipment and fleet management software systems
- Develop and use information systems to support critical repair, rebuild and replace decisions
- Evaluate financial alternatives and complete financial impact and equipment-operating costs
- Analyze equipment intensive operations to improve production and unit costs
- Use historical data to calculate costs
- Balance cost and reliability throughout an optimum economic life
- Set internal rental rates for individual machines and fleets
- Improve the value of the equipment management function

Expert Instruction:



Mike Vorster is the David H. Burrows Professor of Construction Engineering at Virginia Tech, where he has taught since 1986. His teaching and research interests focus on construction equipment, contract administration, and contract dispute resolution. He is the academic advisor to the Association of Construction Equipment Managers, and he is a contributing editor to Construction Equipment.



Preston Ingalls is the President and CEO of TBR-Strategies, and is an experienced maintenance and reliability consultant. Over the past 33 years, he has analyzed, designed and implemented numerous organizational improvement projects and change efforts for numerous companies, and has worked the past five years exclusively with construction companies and oil and gas producers .

Program Topics:

Managing the fleet within the organization. The fact that the fleet must be managed within the organization as a whole will be stressed and a number of issues associated with organization design, responsibility and authority will be discussed. Fleet management functions will be discussed in detail.

OWNING COSTS - The factors that impact owning costs will be reviewed. The need to determine and include residual market value and return on invested capital will be stressed as will the impact of utilization on the hourly cost of ownership.

OPERATING COSTS - This session will show how hourly operating costs can be estimated by using field data and a knowledge of component replacement cost to determine the relationship between repair cost and machine age.

ECONOMIC LIFE - Previously developed knowledge of owning and operating cost will be combined to develop a methodology for determining economic life and answering the interdependent questions "How much does it cost?" and, "How long do I keep it?"

MAINTAIN, REPAIR, REBUILD REPLACE - Maintain, repair, rebuild, replace will be defined and presented as a spectrum of decisions made in the normal course of fleet management. The importance of preventive maintenance as the first line of defense will be stressed and it will be shown how the cumulative cost model can be used to evaluate repair rebuild decisions.

MAINTENANCE BENCHMARKS (NEW) - This session will focus on comparing maintenance performance and costs metrics against Industry Averages, Best in Class and World Class. Participants will also have an opportunity to evaluate their own practices as an exercise.

EQUIPMENT ACCOUNTING AND FINANCE - The session will emphasize the accounting, finance and cash flow aspects of equipment ownership and develop the language needed to improve understanding between equipment operations, finance and accounting.

WORLD CLASS MAINTENANCE PRACTICES (NEW) - During this session, participants will learn the key elements to successful maintenance practices. We will share the results of five extensive studies and several case studies that illustrate the essentials to improve fleet and equipment asset management.

DATA, INFORMATION AND PERFORMANCE MEASURES - This session will draw a distinction between data and information and propose quantitative measures that can be used for equipment and fleet management

IT SUPER USER ROUND TABLE (NEW) - This session will have actual "super users" sharing how to maximize the use of the equipment management module of an enterprise system. Participants will learn the various features and capabilities of an information system, how bolt-on programs can enhance functionality, essential reports, required structure for equipment management, cost tracking, and key characteristics of a good computerized maintenance management program.

TOTAL PROCESS RELIABILITY STRUCTURE (NEW) - This session focuses on the use of TPR to create operator ownership, organizational buy-in to maintenance improvement and the infrastructure necessary to support the process.

Visit www. ConstructionEquipment.com to find out more!

By HEATHER BURLINGAME, Senior Production 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.



Atlas Copco

The 5,512-pound HB 2500 hydraulic breaker is designed for carriers weighing 29 to 43 metric tons and accepts hydraulic flows to 58 gpm at a pressure of 2,610 psi. AutoControl adapts the breaker's frequency and power output to match operating conditions and fires the first blow at half power to establish a pilot notch that centers the tool and helps prevents slippage.

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Superior Signals

Safe-T-Lock programmable code switch prevents unauthorized use of machinery. STL1000 allows up to 99 users to be input for tracking machine usage. If an accident or damage occurs, the last operator is readily identified. An internal clock records "on" hours and notifies the operator when the vehicle reaches the 250-hour mark. A 4- to 8-digit personal access code can be chosen for each user, and a separate supervisor user menu can be used to program the unit.

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Caterpillar

Cat's 2007 truck-engine lineup will include a vocational version of its C13 that will cover applications now handled by the C11, which will be dropped. The C13 has ratings from 305 to 370 horsepower and 1,050 to 1,550 pounds-feet; its torque curve favors low-end performance desired by current buyers of the C11, primarily mixer operators. Because there is little mechanical difference between the two models, the C13V's weight of 2,610 pounds (including a diesel particulate filter) is within 10 pounds of a C11.

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Bobcat

Available in two digging-depth versions, 4- and 5-foot, the new Bobcat LT414 trencher attachment will accept hydraulic flows ranging from 26 to 40 gpm. The new attachment provides hydraulic side-shift and a large-diameter auger that can be removed when working next to obstructions, such as a building wall. Chain widths of 6 and 8 inches are available for both versions.

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Equipment Resources

Equipment Resources builds a grader attachment that is designed to connect to any "major brand" of skid-steer loader. According to the company, the grader attaches to the host machine in just five minutes after the initial setup. The 3,100-pound, 94-inch-long attachment features a standard 8-foot moldboard with 16 inches of vertical lift and 56 degrees of swing. Options include a side-shift feature (24 inches), front-mounted scarifier, 300-pound counterweight and an 8-foot slope board.

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Petro-Canada

Duron-E is an API CJ-4 (formerly PC-10) category oil for low-emissions 2007 engines. It will complement the current Duron line of heavy-duty engine oil for on- and off-road engines. Versus the previous CI-4 Plus category, the oil features enhanced soot-fighting capabilities and improved wear protection, oil consumption and piston deposits. It is available in 15W-40, XL Synthetic Blend 15W-40 and Synthetic 10W-40.

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Market Watch Lite

Atlas Copco



With 99 tons of crushing force at the jaw tip, the DP 2800 hydraulic demolition pulverizer has a service weight of 6,173 pounds and is suitable for carriers in the 24- to 38-ton weight class. With a maximum pressure of 5,076 psi and maximum hydraulic flow of 79 gpm, it has jaws that open to a width of 35 inches. This wider opening lets the unit handle larger pieces of debris, making it suitable for the primary demolition of light- to medium-reinforced concrete structures, secondary reduction and material separation. The unit's replaceable blades effectively cut rebar as the tool penetrates through concrete. The blades are reversible to provide longer service life.

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Kaeser

The M14 portable rotary-screw compressor provides variable pressures from 70 to 190 psig. The company's Sigma Profile airend is paired with an 18-hp Briggs & Stratton gasoline engine to produce 50 scfm at 100 psig.

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Topcon



The RT-5SW long-range, dual-slope laser retains features of the RT-5S series, including five-arc-second accuracy — less than 1/32 of an inch per 100 feet. Smartline automatic guide-alignment system matches grade by automatically scanning to hit the alignment target. The unit will then rotate the transmitter's grade mechanism to match the target's exact center.

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Allied-Gator

Equipped with the Shear Jaw Set, MTR 90 Multi Tool has a 35-inch jaw opening, a 35-inch throat depth and delivers 1,500 tons of force for processing structural steel and scrap metal. "Replaceable Tip" aims to prevent excessive wear or damage to the tip from affecting the shear knife or other critical areas of the tool. Cracker/Crusher Jaw Set processes reinforced concrete and heavy cast material.

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Oasis

3000-Series air compressors feature special oil-control piston rings which, says the manufacturer, minimize crankcase-lubrication discharge into the compressed-air supply. The HP3000 and XD3000 are 12-volt DC models designed for use on commercial service trucks.

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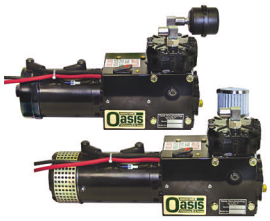



Hobart

For single or multi-pass welding, Formula XL-550 gas-shielded flux-cored wires deliver x-ray quality welds in all positions. Added deoxidizers cut through light rust with minimal pre-cleaning. For use with 100-percent CO2 shielding gas, the wire is available in diameters of 0.045-, 0.052- and 1/16-inch.

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Parker

Designed as a universal one-wire hose for global requirements, Parker's 422/421 Worldwide hose offers higher working pressures than the existing Parker 421 hose. The nitrile inner tube provides greater fluid compatibility across a range of hydraulic fluids, including biodegradable ones. It is available in sizes –4 to –32.



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Site Armor

The Curb Cushion protects surmountable and B-style curbs from damage from equipment. Made of lightweight, high-density foam, the cushion conforms to the surface of the obstacle and distributes the load to prevent curb damage. It is reusable. One pair costs $489.

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Atlas Copco



MG 1800 hydraulic demolition multi-grapple has a load capacity of 1.1 cubic yards and a maximum closing force of 8 tons. With a service weight of 3,968 pounds, it fits carriers in the 20- to 30-metric-ton weight class. It operates at a maximum pressure of 5,076 psi and accepts maximum hydraulic flow of 40 gpm. Each jaw tip features a replaceable wear edge that can be flipped to provide a second wear surface.

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Leica

TPS400, TPS700 and TPS800 Total Stations now feature electronic-distance measuring (EDM) technology. A narrow, visible laser beam (PinPoint) measures distances to curved surfaces, corners and inaccessible points.

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Boss Snowplow

TGS 600 Tailgate Spreader has a 400-pound capacity and low-profile design. It spreads dry, free-flowing material and fits Class 3 and 4 receiver hitches. Other features include an adjustable feed gate, adjustable material deflector and internal auger with chain-link agitator. It comes with a two-year warranty.

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Market Watch Lite

EnerSys

This light-truck battery features a "dual Group 34/78 footprint" that enables it to fit a greater number of vehicles. The 12-volt Odyssey PC1500 is designed for a service life of six to eight years. It uses absorbent glass mat technology and is certified non-hazardous and "non-spillable" by the U.S. DOT and the International Air Transport Association.

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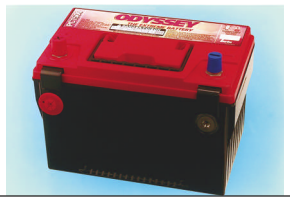

Hiniker



1852 and 1952 DA-Series V-Plows use double-acting angling cylinders for full moldboard control in all positions. Users will need no optional locking cylinders or end enclosures when backdragging snow, says Hiniker. The plow provides variable cutting widths and mounts on full-size, heavy-duty pick-up trucks. A compact joystick controller is either hand held or velcro mounted in the cab.

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Link It Software

EZ Maintenance Web provides alerts to pagers, PDAs and cell phones. The web-based maintenance service from Link It Software tracks and schedules preventive maintenance and controls equipment inventory. Other features include online work orders and the ability to link to QuickBooks.

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Atlas Copco

The MB 700 hydraulic breaker has a service weight of 1,650 pounds and fits excavators in the 10- to 18-metric-ton weight class. Maximum impact frequency is 800 bpm. It operates with flows to 32 gpm at 2,465 psi. Auto-Start allows the MB 700 to begin operating as soon as it contacts the material to be broken.

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Bobcat

Contractors can remove roots, brush, rocks and other debris from the jobsite, yet leave the dirt behind, when using the new 66-inch root grapple from Bobcat. The grapple's curved teeth are designed to allow the operator to scoop up material without plunging the tool into the ground. The root grapple is available also in widths of 72 and 80 inches.

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Trimble

Spectra Precision TS505 mechanical total station provides one-person operation without a prism. The portable layout and measurement tool is designed for layout of control line, offset points, excavation lines, foundations, forms and footers, and anchor bolts. It can also check plumb, layout arcs, and check distances. It incorporates direct reflex reflectorless distance measuring.

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L&M Radiator

Mesabi M-Series flexible-core engine radiators are designed to provide added cooling capacity within the space of previous designs. The M-Series is the result of reconfiguring the individual copper cooling tubes and the tube fins.

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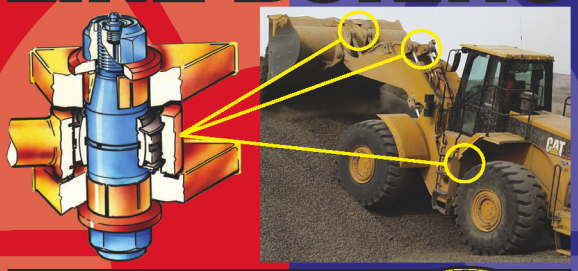

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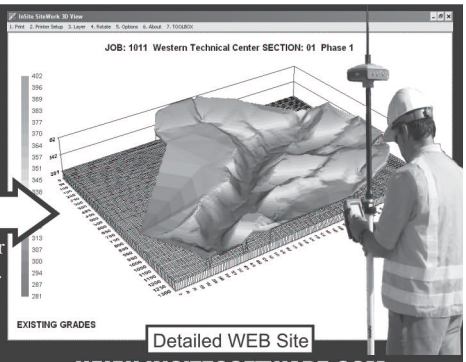

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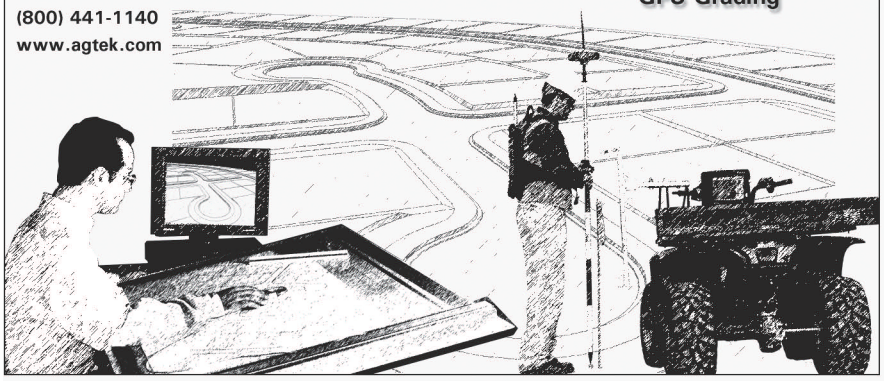

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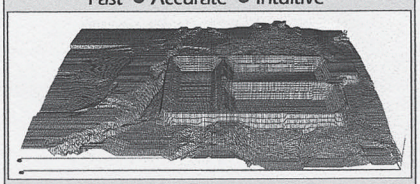

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IL, MI, WI, OH
Patricia E. Maroder, Regional Manager
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IA, IL, MN, ND, SD
Mary Adee, Regional Manager
630/288-8134; madee@reedbusiness.com

East, Southeast, Eastern Canada
Michelle Lorusso, CBC, Regional Manager
770/209-3623; mlorusso@reedbusiness.com

Southwest, West, Western Canada
Terry McGinnis, Regional Manager
801/273-8790; Fax: 801/273-8799
tmcginnis@reedbusiness.com

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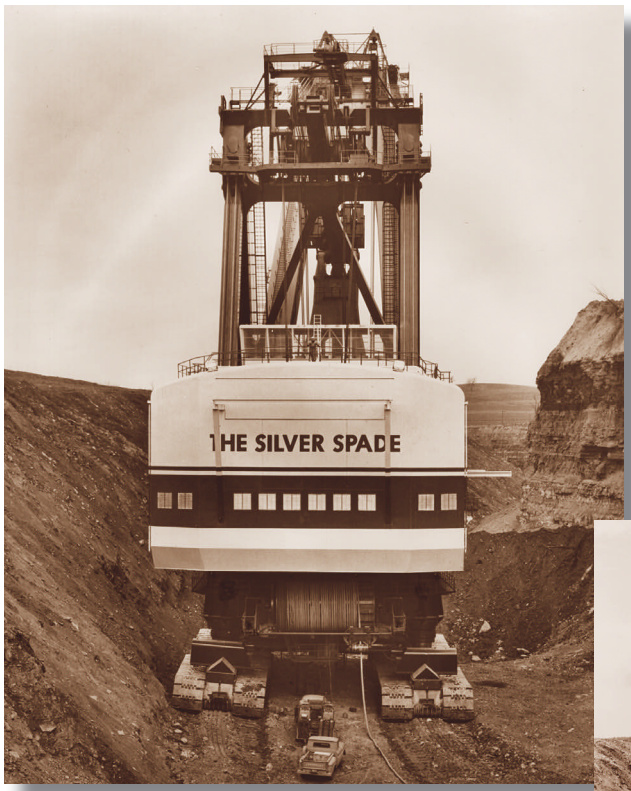



Silver Spade Retires

One of America's largest earthmoving machines ceases production

Upper left: Rear view of Silver Spade stripping shovel taken soon after starting work in 1965. Note the size compared with a pickup truck. Inset: The Silver Spade at work in 2003.

On April 10 this year, the Silver Spade — one of America's largest earthmoving machines — shuddered to a halt, bringing to an end the era of giant stripping shovels. For almost a century, these giants of the strip-mining world helped to uncover rich coal seams lying relatively close to the surface and provide coal for the nation's electricity-generating facilities. Stripping shovels worked in the same way as regular cable shovels, but unlike their smaller counterparts, they did not load trucks to carry material away. Their huge proportions allowed them to cast the excavated material into worked-out pits, clear of the working area.

Today most of the coal within the range of even the largest stripping shovel is worked out, and other types of equipment are now employed to mine the deeper coal. Strip miners prefer walking draglines which are more flexible in operation and can uncover deeper coal, or they prefer smaller shovels in combination with truck fleets as dictated by the geology of the vast coal seams in the western States now providing the lion's share of the nation's coal needs.

The Silver Spade, or Bucyrus-Erie 1950-B to use its model designation, was not the largest shovel built but was probably the most famous as the last of its type operating. With an estimated weight of 7,200 tons, she operated with a 105-cubic-yard dipper on a 200-foot-long boom, measured 59 feet wide at ground level, and reached a height of 191 feet to boom tip.

The behemoth shovel was served by a 7,200-volt trailing cable weighing 20 pounds per foot. On board, AC main driving motors totaling 9,000 horsepower drove DC generators for the shovel's main motions — hoist (8 motors), swing (4 motors) and crowd (2 motors). The massive weight of the machine was supported on eight crawler track assemblies, each with its own DC motor.

The 1950-B was built by Bucyrus International and started work in November 1965. Purchased by the Hanna Coal Co., a division of Consolidation Coal (Consol), for coal stripping in the Georgetown area of Ohio, she was named to commemorate the 25th anniversary of Hanna Coal.

The Silver Spade's final production day was April 3, 2006. After that, she proceeded to climb out of the final pit and head for a designated resting place. But before she arrived, a breakdown occurred on April 10 leaving the shovel dead in her tracks and marking the end of an era. She had served her owners well during her active life, moving a total of 607,226,370 cubic yards of overburden. The Spade's final fate is unknown at the time of writing, but a local preservation group wants to see the shovel preserved as a tourist attraction.

The Spade and other giant stripping shovels built in the 1960s helped to lower production costs and boost an ailing coal industry. Now, with modern earthmoving equipment, that trend continues with coal currently providing over half the electric power generated in America today.

Read more about stripping shovels and walking draglines in Keith Haddock's book "Extreme Mining Machines" available in most bookstores. For more information about the Silver Spade's preservation group, call Claren Blackburn at 740-937-2460.

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