Reed Business Information.

48 On the road with the 11-speed grader

62 Latest look at heavy-hittin' hammers

77 More traction from auxiliary tracks

October 2006
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What to expect from new engines, emissions hardware

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*2007 Dodge Ram 3500 Heavy Duty Chassis Cab vs 2006 Ford and GM one-ton, pickup-based Chassis Cab models.

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Cover photo by John Boykin ©

FEATURES

COVER STORY: Truck Report

22 Are You Ready for January Engines?

Brace yourself for January 1st. That's when the federal government's latest round of diesel exhaust-emissions regulations take effect and, as you've probably heard, they'll result in new, heavier engine equipment and substantially higher prices. New 2007 diesels will burn much cleaner, will run hotter, and need special fuel, motor oil and servicing. Many big fleets are stocking up on current models to avoid price hikes and added complexity. Truck editor Tom Berg gives you the skinny and also reports on '07 Class 8 trucks.

FIELD REPORT

48 Experts Evaluate Volvo's 11-Speed

Veteran operators George McHattie and Gord Diamond offer opinions about the new 11-speed transmission available for Volvo's recently introduced G900 Series motor graders. The operators used two G940s, one with a conventional 8-speed transmission, the other with the new 11-speed, to grade a county road, to trim road-base limestone, and to hog out dirt in a ditching exercise.

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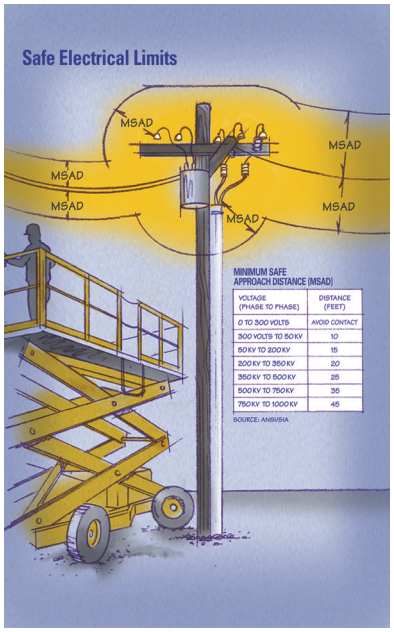

PRODUCTION HEROES

58 Prepare to Work Safely From Work Platforms

Aerial-work platforms are typically used by people who are trained in the trades. The machine is a means to reach their work, and operating it is secondary to their trade. That's why the industry — OSHA, ANSI, ISO, lift manufacturers, and others — is working to train operators. AWPs are fairly simple, stable machines but because they raise people to heights, there is inherent risk in their operation. Executive Editor Larry Stewart reports on such safety tips as walk-around inspection, worksite assessment, function test, proper operation and proper shutdown.

BUYING FILE

62 Better Than Ever at Bustin' Hard Stuff

Technical advances in today's mounted hydraulic breakers include, for example, the ability to tailor start-up/shut-down behavior and to adjust the impact energy/blow-frequency ratio to suit the operating situation. Also, more breakers today are running with automatic greasing systems, they're quieter than ever before, and they are being engineered for protection against on-site hazards, including inexperienced operators. And lest we forget, they're also easier to service.

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Another Round of Engines

Déjà vu. The American Heritage Dictionary defines it as "an impression of having seen or experienced something before." It's not an impression with engines, though; we have seen it before.

This go-round is a bit different, though, because it's not just the engines that are changing. Aftertreatment, another reformulation of lubricants, and upcoming fuel changes have coupled with engine redesigns to cause truck buyers to not only feel deja vu, but also more than a little sense of foreboding.

Rod Sutton, **Editor in Chief**

For the record, truck manufacturers are sold out through the end of the year due to pre-buying. This round of engine changes promises price increases as high as $10,000 per heavy truck, and many owners would rather have a new truck with a pre-regulated engine than the latest clean version for a few dollars more.

For the professional equipment manager, the march to engine-emissions nirvana has taken on an entirely new drumbeat. They are less concerned with the cost of new engines as they are about low-sulfur fuel and all the aftertreatment hardware that's being integrated onto the machines.

Purchasing the truck (and later, the machine) is only the first step. Maintaining these engines' attendant support systems could be new territory. New engines will run hotter, exhaust filters have been added, low-sulfur fuel will need to be stored in separate fuel tanks, and low-ash motor oils will need to be specified.

From the operational side, fleet managers must ensure that higher costs for fuel and lubes will be covered. They must train their technicians to maintain the aftertreatment hardware, and they must also account for those costs.

From the performance side, the new round of engines seem to deliver. According to our truck editor, Tom Berg, the new engines will drive better and even use less fuel. You can read his in-depth look at the new engines in the 2007 models on page 22.

In addition, you can go to the ConstructionEquipment.com archives and read our special report on the new breed of engines. Just find the November 2005 issue under the archives dropdown, and look for Special Supplement. There, you'll find five articles that provide a detailed look at regulation timelines, current developments, and maintenance strategies.

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MARKET WATCH

By KATIE WEILER, Managing Editor

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Takeuchi

Takeuchi-US has added a four-model line of compact wheel loaders (TW50, TW60, TW65 and TW80) ranging from 8,700- to 12,600-pound operating weights. Engine lineups for the series include Perkins 404C-22 on the TW50, Perkins 404C-23T turbo on the TW60, and Deutz F4L 2011 on the TW65 and TW 80. Features include frame oscillation and articulation, 100-percent inching pedal, bucket float and automatic bucket position. Each is covered by a one-year, unlimited-hour warranty.

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Vogele

The Super 700 paver with electrically heated AB 200 V screed has the ability to drive through an opening less than 4 feet wide. It can pave within 2 inches of boundaries and drive in a footprint of 113 inches. The unit is powered by a liquid-cooled Deutz diesel engine rated at 57 horsepower at 2,300 rpm. It can be operated with one person, and it has two positions for an operator to stand — either on the screed or on an elevated platform.

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New Holland

The W170B and W190B wheel loaders boast more power, improved functionality and larger cabs than their predecessor models. They are powered by Tier 3 engines rated at 195 and 227 gross horsepower, respectively. The W170B is offered in both standard and tool-carrier configurations. Both machines come standard with four power modes: max, standard, economy and auto power. Operators can maximize fuel efficiency by using the proper power mode for the job.

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Bobcat

Model 329 is aimed at the contractor looking for an "entry-level" compact excavator with conventional tail swing. This machine has a maximum digging depth of 10 feet 2 inches and a maximum reach of 16 feet at ground level. The hydraulic system, says Bobcat, features a dual-outlet piston pump that enables the 329 to maintain constant digging forces and to sense (and react to) hydraulic loads for efficient utilization of the engine's torque curve.

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Five Star Industries

Using base designs from the old Barber-Greene Co. (bought by Caterpillar in the early '90s), Five Star Industries updated a self-propelled road widener and asphalt windrow elevator. Sold under the Weiler brand name (no connection to *CE*'s managing editor), Model W730 is a 10-foot-wide road widener (right) designed to handle many widening applications. It is capable of widening roads from 1 to 12 feet with a working depth ranging from 12 inches above grade to 12 inches below grade. An optional long conveyor and weight kit can widen widths up to 14 feet.

The established E650 asphalt elevator (below) features a 118-inch-wide throat and a 58-inch-wide high slant entry position conveyor, which is said to allow the unit to accept tall windrows on high production and wide-width projects. In addition, the machine offers 7-inch-deep slats and 29-inch-diameter infeed augers that help reduce particle size segregation.

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Gehl

A new compact excavator, the zero-tail-swing 383Z, weighs in at 7,826 pounds with a canopy and 8,002 pounds with a cab. Powered by a 29-hp Yanmar diesel engine, the machine features a long undercarriage, automatic two-speed drive and spiral-grease-groove bushings in all critical pivot points.

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Bobcat

Bobcat makes the point that users of compact excavators in the 3- to 4-metric-ton size class can move up to the larger 9,170-pound Bobcat 335 without having to invest in a larger trailer or towing vehicle. This 40-hp machine digs to 11 feet 8 inches and has a maximum reach of 17 feet 10 inches at ground level. A two-speed travel system propels the machine at a maximum of either 2 or 3.4 mph. The 19.8-gpm flow in the 335's auxiliary hydraulic system is activated by a thumb switch in the right joystick and, says Bobcat, allows precise control of the direction and rate of flow.

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Compact Power

Compact Power has just introduced its model 526DX Boxer mini-skid loader, which is diesel-powered (a 26.1-hp, liquid-cooled Perkins) and features a rubber-track undercarriage that can retract from 43.5 to 35 inches. With a rated operating capacity of 1,050 pounds, the 526DX has a hinge-pin height of 77 inches and a dump height of 60 inches. Two hydraulic pumps, producing a flow of 14.5 gpm at a pressure of 3,000 psi, handle the machine's auxiliary and travel functions. Compact Power's ProHauler-System trailer accommodates the 526DX and a package of attachments, including a 44-inch bucket, trencher (36 inches long by 6 inches wide), auger power head with four bits of different diameter, lifting forks, tiller, scarifier and leveler.

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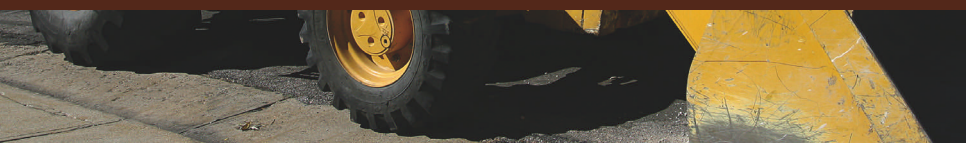
"With GlobalTRACS, we've created a management system that saves money and helps our fleet last longer."

- C.J. Thoutt, Fleet Maintenance Supervisor, Thoutt Brothers Concrete Contractors, Inc.



Thoutt Brothers is one of Colorado's largest concrete contractors. With so much equipment out there – and so much risk of loss, damage or theft – C.J. realized he needed a better management system. He found QUALCOMM's GlobalTRACS® equipment management solution. GlobalTRACS constantly monitors location and engine usage on every machine, and then sends the information directly to the company's computer system.

"We've built our entire maintenance program around GlobalTRACS," C.J. says. "It provides us both engine usage hours and GPS information, which we can easily share online with our maintenance partner. On any given day, they can tell us which machines need service, and scheduling is a breeze. Before GlobalTRACS, our preventive maintenance program was really ineffective – we spent most of our time just fixing whatever machines weren't working."

GlobalTRACS also helps C.J. operate his fleet more efficiently. Every night, GlobalTRACS "pings" each machine to make sure it's where it's supposed to be, and logs how many hours it has been used. "I found one tractor that had been on a jobsite three weeks without being used at all," he says. "In just a few hours, I was able to put that machine to work, instead of it just sitting idle and costing us money."

C.J. also likes working with QUALCOMM. "You know they're here for the long haul," he says, "and they're very good at answering my questions and providing the support I need.

"GlobalTRACS has really improved our operations. It's an excellent system and a great investment."

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Watch

Case

Case 327B and 330B articulated trucks have Tier III-certified Case 10-liter diesels and ZF limited slip axles providing 2-, 4-, and 6-wheel drive. Greater operator comfort and productivity is touted with the fully adjustable, ergonomic cab with floor-to-ceiling glass and the availability of automatic or manual modes. Front driveline has a front suspension system and an integrated transmission-mounted differential that transfers power directly to the front wheels.

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Clement

JobStar Western Train offers extra production for western markets. The double trailer train has a 40-foot tri-axle lead trailer followed by a 24-foot "pup" trailer, hauling 20 and 14 cubic yards, respectively. The trailer uses 3/16-inch sheet steel throughout the hopper. Framework structure is designed with the long beams used as an air tank for the operation of the trailer.

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Manitowoc Crane Group

A long-boom version of the Grove GMK4115 all-terrain crane is now available. Offering a 197-foot, seven-section main boom, the GMK4115-L telescopes to maximum reach in less than nine minutes, the company says. It has a maximum tip height of 272 feet, thanks to a 33- to 56-foot bi-fold hydraulic luffing swingaway jib, which is able to accommodate a 16-foot insert.

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MANUFACTURER NEWS

Manitex Buyer Armed with Capital

Veri-Tek International purchased boom-truck and crane manufacturer, Manitex. Manitex revenues grew 63 percent between 2003 and 2005, reaching about $62 million last year. David Langevin, Manitex CEO, will serve as CEO of Veri-Tek and was also elected Veri-Tek's Chairman of the Board.

"Manitex has bright prospects for the future, including our growing application in the energy sector," says Langevin. "We believe that Veri-Tek's ability to access the capital markets will allow for strong growth and development of the combined company."

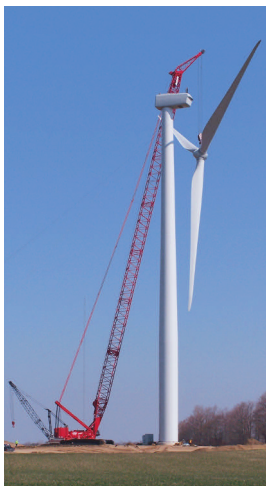
JOB SOLUTIONS

Crane Power Helps Harness Wind Power

On a recent trip to Ontario, Canada, to visit with Volvo Construction Equipment, *CE* editors were impressed with the immense size of the numerous wind-powered generators spaced along our route up the eastern shore of Lake Huron. How ever do they construct these things?

So when we later received a story from the Manitowoc Crane Group about a couple of model 16000 lattice-boom crawler cranes at work in Ontario, it came as an answer to our question. The two machines, working along the northern shore of Lake Erie, erected a total of 66 three-section wind-turbine generators to a height of 262 feet.

The project, the Erie Shores Wind Farm, was managed by HB White Canada Corp., a subsidiary of Indiana-based White Construction USA. When complete, the project will provide 99 megawatts of electricity, enough, we're told, to power 32,000 homes in the region.



Equipped with the capacity-enhancing MAX-ER attachment, the 16000 can handle 394 feet of main boom.

RESOURCES

Gain Maintenance Knowledge on Your Own Time

Chevron's Lubricants University (www.lubricantsuniversity.com) has introduced a new self-study, web-based course, "Fundamentals of Hydraulic Systems," as part of its online training portfolio. The module is said to increase the understanding of hydraulic-system components, lubrication procedures, and potential hydraulic-system problems. It also reviews hydraulic-oil performance specifications and trends.

"The new hydraulics course is an efficient and cost-effective way for technicians and maintenance managers to increase their knowledge of hydraulics and value at the worksite," says John Geyer, grease marketing manager, North American Lubricants at Chevron.

Courses are available to the general public at a cost of $59.95 each. To purchase a course by credit card, call 1-866-758-2378; for subscription information, e-mail lublearn@chevron.com.

MANUFACTURER NEWS

Cat Will Raise 2007 Prices

In an early-September filing with the SEC, Caterpillar said it "will announce a general price action of up to 5 percent for machinery and up to 7 percent for engines. This price action, announced to Caterpillar dealers worldwide, is in line with expected general economic conditions and industry factors. This price action will be effective January 2007."

Cat expects continued strong demand for mining and construction equipment. And, recently, the company has had difficulty producing fast enough to keep pace with demand. In its second-quarter financial statement, CEO Jim Owens said, "we're continuing to work with suppliers and within our factories to remove bottlenecks and increase production for a number of our products."

Caterpillar has increased prices more than 13 percent in the past two years, fueling the strongest profits in company history. On the day of Cat's price-increase announcement, its stock-price increase led a rally by Wall Street's Dow Jones industrials.

MANUFACTURER NEWS

TBEI Purchases Heil Truck

Truck Bodies & Equipment International (TBEI) has purchased Heil Truck Equipment Group of Tishomingo, MS. TBEI manufactures dump-truck bodies, hoists and related equipment, marketed under Crysteel, Hardee, Ox Bodies and Rugby brands. Heil manufactures/mounts a complete line of dump bodies, snow/ice bodies and hoists. Heil South is a company-owned truck equipment distributorship in Austell, Ga. TBEI will continue to make Heil products in Tishomingo. Combined annual revenues should total more than $200 million.

INDUSTRY NEWS

EQUIPRO Franchises Repair Light Equipment

EQUIPRO focuses on providing repair service and on-site support to owners of light construction equipment. It's a subsidiary of Wacker. The company plans to expand nationwide. Franchising since June 2005, the company has 12 service centers and plans to add 21 locations by the end of 2006.

EQUIPRO's alliance of original equipment manufacturing (OEM) partners currently includes ICS, Lincoln Electric, MI-T-M, MK Diamond, Sullair and Wacker. The company plans to add two to four partners to complete the business model.

"Many light construction equipment dealers have cut back on service and parts support — resulting in longer downtime, longer replacement-equipment rental periods and greater expense for the customer," said Peter Liesch, president of EQUIPRO. "At the same time, the light-equipment market is projected to grow by more than 9 percent throughout 2006. Our concept provides a cost-effective, high-quality repair alternative to traditional independent service centers."

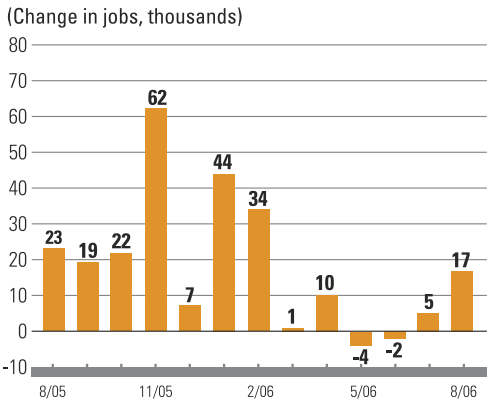
Certified technicians trained by EQUIPRO's OEM partners repair equipment. Average turnaround time is three to five business days. EQUIPRO offers authorized warranty service, and will provide customers with detailed repair estimates before performing any work. Full-service repair, parts, and warranty support are also available for Briggs & Stratton, Honda, Kohler, Robin Subaru and Wacker engines.

For more information, visit www.equiproservice.com or call 1-866-EQUIPRO.

Wacker subsidiary's factory-trained technicians repair light equipment from ICS, Lincoln Electric, MI-T-M, MK Diamond, Sullair and Wacker.

STATUS & FORECAST

↑Construction Employment



Source: U.S. Department of Labor

Contractors added 29,000 jobs in the past six months, a sharp decline from the 188,000 added in the previous six months. A pickup in hiring to about 60,000 is expected in the next six months. Weaker hiring is the net of fewer jobs in homebuilding, aggressive hiring by nonresidential building contractors, and a small amount of hiring by residential remodelers and heavy contractors. Nonetheless, expect larger construction wage gains ahead to catch up with the recent surge in consumer inflation.

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

RENTAL NEWS

Sunbelt and NationsRent to Merge

Ashtead, the European parent to Giant rental company Sunbelt, reminded us all of how attractive the rental industry is to investors during good times when it announced on July 19 that it would buy NationsRent for more than $1 billion. After the acquisition, the combined Sunbelt and NationsRent operations will operate about $2.2 billion worth of equipment from 477 outlets in 35 states, employ over 7,000, with combined 2005 revenues of about $1.4 billion.

The consolidation will likely claim the No. 3 spot among U.S. rental operations, but that same week in July, Atlas Copco CEO Gunnar Brock said his company would likely finalize sale of RSC in this third quarter of 2006. The nation's second-largest rental company, RSC, will no doubt put some distance between itself and the new Sunbelt/NationsRent No. 3.

The rental industry's impromptu raid on Wall Street kicked off when the new owners of Hertz filed an initial purchase offering on July 14 to take their company public. In that same seven-day period, H&E Equipment Services announced that its share price had more than doubled since going public in January. And Diamond Castle Holdings completed its $850 million purchase of NES Rentals.

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CONSTRUCTIONEQUIPMENT.COM NEWS

Online Equipment Specs Are Updated Monthly

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

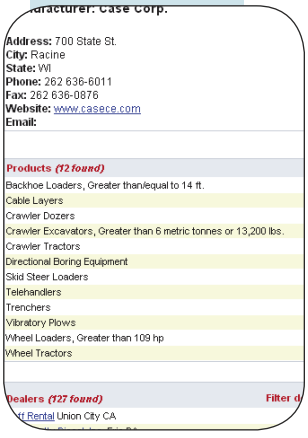
Each month, Spec Check adds, on average, 100 new models and processes revised specs for 100 more.

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

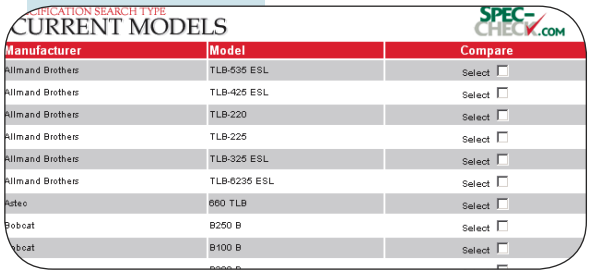
How to Use ConstructionEquipment.com

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

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



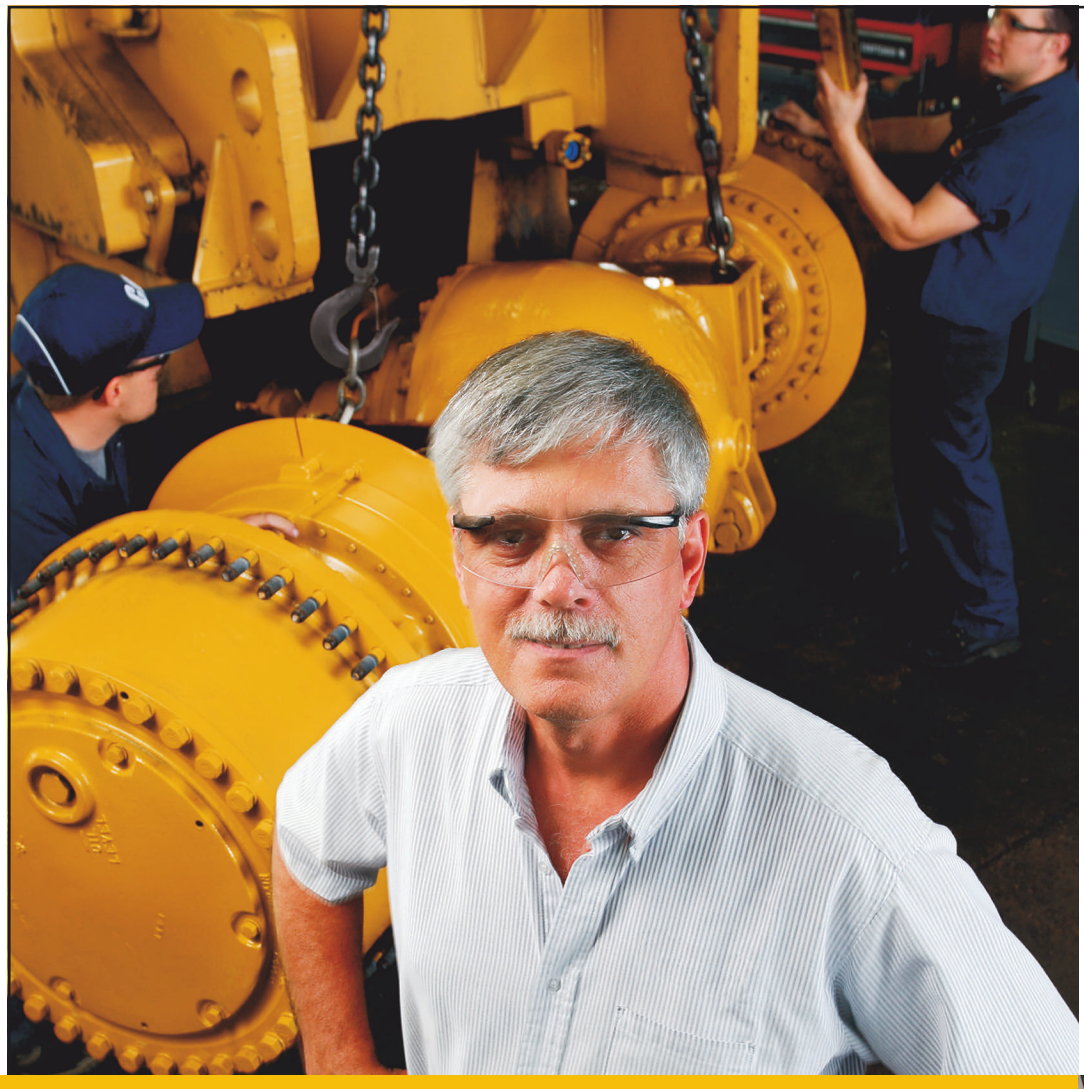
From Specifications in the horizontal navigation bar, compare specs on 63 types of construction and forestry equipment at no charge.



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

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

Scan headlines from news around the country. Click on the headline and read more pertaining to construction, equipment and related topics.



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By TOM BERG, Truck Editor

Are You Ready For January Engines?

New 2007 diesels will burn much cleaner, will run hotter, cost more, and need special fuel, motor oil and servicing

Brace yourself for January 1st. That's when the federal government's latest round of diesel exhaust-emissions regulations take effect and, as you've probably read or heard, they'll result in new, heavier engine equipment and substantially higher prices. That reality has generated a storm of orders, especially from freight haulers for whom trucks are a major part of doing business. Many big fleets are stocking up on current models to avoid looming price hikes and added complexity. Heavy-truck manufacturers are sold out through the end of the year.

The "pre-buy" is also being pushed by a healthy economy and high freight tonnage, which requires fresh trucks to move things. The situation mirrors the runup to the October '02 deadline and, as happened then, a sales slump is expected to follow the frenzy. Many buyers will hang back to see how the new trucks and engines behave, then slowly return to the market.

Other users, including some in the construction segment, are more sanguine because trucks are among many expensive tools in their equipment fleets. Manufacturers say that most vocational buyers are becoming aware of the upcoming changes, and seem resigned to face the realities of greater complexity and higher price when they arrive. Or they'll hang onto the trucks they have now for a while longer.

Clean Air advocates should celebrate the vehicles that will comprise the latter part of the '07 model year. Diesels will burn cleaner than ever, emitting only half the oxides of nitrogen (NOx) and one-tenth the particulate matter (PM) of current diesels. This arguably is a substantial societal benefit, though most users wince at its cost.

A diesel-powered light truck is expected to run $1,500 to $2,500 more than now; a medium-duty truck will cost $3,500 to $7,000 more, and a heavy truck will list at $6,000 to $10,000 higher, according to builders who have announced pricing. Buyer resistance and competition might cause those numbers to fall somewhat, especially if orders for new trucks fall off by 30 to 40 percent, as some predict.

Once in buyers' hands, the new diesels will need special care. They'll run hotter, putting more load on trucks' cooling systems, some of which have been beefed up to handle the extra heat. New exhaust filters will periodically

heat up to burn off accumulated soot. Engines will burn ultra low-sulfur fuel that is just now becoming available, and is expected to cost more than present fuel. They'll use a newly formulated low-ash motor oil that may also cost more. Eventually the diesels will require new maintenance procedures, which will take some extra time and know-how.

On the other hand, the 2007 engines will drive as well and maybe better than now, and should use no more fuel than current diesels, and in some cases less. Previous changes in emissions regulations have sometimes meant worse fuel economy. So holding the line is not an insignificant accomplishment for the engine makers who have labored long and hard to meet the upcoming limits, and truck builders, who have spent hundreds of millions of dollars to engineer the new diesels into their chassis. Then again, the new fuel will have a bit less energy content, which could degrade measured tank mileage, and there are questions about its lubrication properties.

Some manufacturers have used the challenge to make major updates to certain models. Some trucks will look different and be nicer to drive, and some are getting new names. We cover many of the changes and updates in our roundup on following pages.

Exhaust aftertreatment

Most '07 engines will exhale through an exhaust system equipped with an oxygen catalyst and a diesel particulate filter, or DPF. The catalyst will chemically change certain pollutants into non-harmful substances, leaving water and carbon dioxide (CO_2 is not toxic, even if it is a greenhouse gas blamed for Global Warming). The DPF will trap particulates, or soot, which will periodically burn off. But ash from motor oil will collect in the DPF and must be removed through special cleaning.

Exhaust heat from high-load highway operations will be enough to burn off soot in a process called passive regeneration, engineers explain. In stop-and-go operations, including what's seen by many construction trucks, extra heat will be needed for what's called active regeneration. This comes from injecting small amounts of fuel into the exhaust stream; when the fuel hits the oxygen catalyst, a reaction causes high heat, which then passes into the DPF and burns off the accumulated particulates.

That generally describes the systems to be used by Cummins, Detroit Diesel (including Mercedes-Benz), General Motors-Isuzu, International (and Ford), Mack and Volvo. The imports — Hino, Isuzu, Mitsubishi Fuso and Nissan UD — are already using such systems in Japan. They will bring them to North America come January. As now, the systems will use exhaust-gas recirculation (EGR), but higher doses of it, to lower cylinder temperatures and reduce formation of NOx.

Most '07 diesels, like this Cat C15, will drive as well as or better than current models. Fuel economy should stay the same or be better, but ultra low-sulfur fuel will cost more and have lower energy content.

Caterpillar is taking a different approach for '07. It will begin using cooled exhaust-gas recirculation, which it has pointedly avoided since October '02. But Cat's EGR will use filtered exhaust gas taken from the end of the aftertreatment device, not raw gas straight from the exhaust manifold as other builders do. In what's called Clean Gas Induction, a pipe carries gas from the rear of the aftertreatment device to the charge-air cooler. Cat claims its system will let engines stay cleaner inside and therefore last longer.

Cat's '07 aftertreatment will have a DPF, but not an oxygen catalyst. The system injects fuel behind the turbocharger and elec-

trically ignites it, sending flame into the DPF; this burns out accumulated soot. As now, Cat will initially clean exhaust gasses with ACERT equipment, including double turbochargers on larger models. Cat and other builders will also upgrade fuel-delivery systems and electronic controls; the latter will get more powerful microprocessors and more capable software. All builders' aftertreatment devices will resemble mufflers and actually muffle combustion noise, so mufflers as such will no longer be used.

A Hot Time

All builders' DPF regeneration will occur automatically. It will be passive when exhaust heat in the device climbs above 450 to 570 degrees Fahrenheit, or active, with minute injections of fuel, if temperatures in the DPF consistently remain too cool.

Heat inside DPFs and at tailpipes will get quite high — 1,000 to 1,200 F. But aftertreatment devices will be dual-walled to insulate their outer skins from heat. Their "touch temperatures" will remain about like they are now, or around 500 F. That's hot enough to smart if someone touches it, but not enough to burn flesh unless he hangs on. Also, aftertreatment devices will be mounted like mufflers, under the truck or on the exhaust stack, where people aren't likely to come in contact with it.

Temperatures at tail pipes could exceed 1,000 degrees F, but measurements show that the heat dissipates fast when the exhaust hits the outside air.

Tailpipe temps sound high, but manufacturers note that they will be about what current gasoline engines produce. And heat dissipates fast when the exhaust hits the outside air. Even so, some builders are talking about adding diffusers at the end of exhaust pipes to be on the safe side.

Regenerative heat could radiate off a truck that's parked near pedestrians or in tall grass, causing discomfort or fires. So most builders plan to lock out active regeneration unless the truck is moving 10 mph or faster, with the actual speed varying among builders. Some trucks will have a switch in the cab to allow drivers or technicians to start a regen if needed, or stop one if it might be dangerous. A dash light would signal when a regen is about to occur or when it is in progress.

Operation and maintenance

Most engine models will run like current ones, though some will run a little slower, and operating rpm might be tighter. So gearing — choosing ratios in transmissions and drive axles — will be even more important than now. Engine makers will disseminate information on proper spec'ing, which dealers should have. But manufacturers encourage sales people and fleet managers to consult with factory experts if there are any questions about specifications.

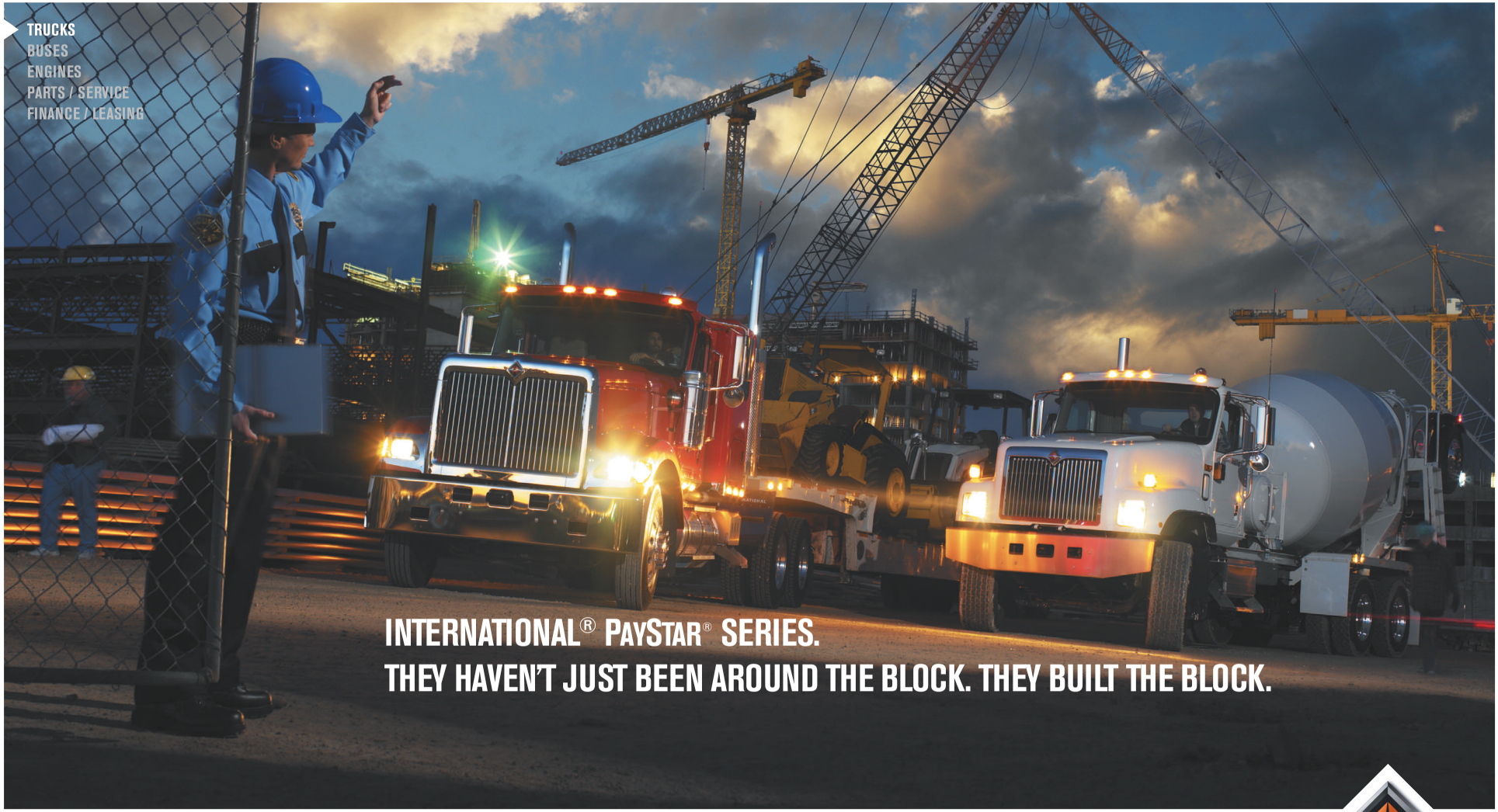
Diesels will burn ultra low-sulfur fuel, which refiners have just begun producing, to keep the catalyst and DPF from clogging. Use of higher-sulfur fuel won't necessarily kill the filters, which are made of ceramics and precious metals. But the extra sulfur will hamper their work and soon plug them, requiring premature cleaning or replacement. So, although there's controversy over the new fuel's distribution and storage problems and possible lubricity issues, owners and drivers should be sure that it's the only fuel that goes into tanks.

Crankcases will be filled with a new, low-ash oil, called CJ-4. Manufacturers say that the new oil, like the fuel, is necessary to protect the exhaust system's DPF. Shops will have to stock up on CJ-4 and for a while, at least, continue using current CI-4 motor oil for older engines. Like previous formulations, CJ-4 will be backwards-compatible, which means it can be used in older engines. But the current type, CI-4, is a better choice for them, as long as it's available.

Filter cleaning

Cleaning ash out of the DPFs will become a new service procedure. In most cases, cleaning will be done by removing the DPF element from the truck — an easy job, partly because parts will be made of stainless steel to resist corrosion, manufacturers say — and placing it on a special machine (though Cat's DPF will come with connections that will allow attaching hoses to clean it right on the chassis).

The console-like machine will blow compressed air at normal shop pressure (about 90 psi) through the filter in pulses; this will take about a half hour, during which the technician can perform other service work on the truck.



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Special machines like this will clean diesel particulate filters with compressed air. Most dealers will have them, and will also offer clean filters on an exchange basis. Caterpillar DPFs can be cleaned while still on trucks.

Removal and reinstallation of the DPF will together consume another half hour and maybe less. Most builders will offer clean DPF elements on an exchange basis, but dealers will probably obtain the simpler and less costly air machines.

Detroit Diesel (which markets and supports M-B diesels) will recommend filter cleaning with deionized water. This will be done on larger, more complex machines at Detroit's remanufacturing centers. In that case, an exchange program will use cleaned filters with dirty filters turned in for core value. Detroit will also allow the air-cleaning method, but says it doesn't work as well as the fluid. A brand-new DPF element, if it's ever needed, will cost hundreds of dollars.

Servicing DPFs won't be needed often, and owners won't have to deal with them until trucks have been run a while. EPA regs require at least 150,000 miles of use on a heavy-duty diesel before the first service is required. Engine makers say it might be required at intervals of 200,000 to 300,000 miles for long-haul tractors. Vehicles run in cities, including construction trucks, will require servicing more often, though relatively low annual mileages will stretch out the intervals in terms of time.

Exhaust configurations

Combined catalyst-DPF devices (or just the DPF in Cat's case), which some truck builders call "cans," look like big mufflers but weigh more — 80 pounds or so — manufacturers say. That includes 50 to 60 pounds for the DPF element. They'll usually be mounted under cabs or in vertical stacks. Cans on stacks might need special lifting devices, and those in other under-cab locations might require a creeper and a transmission jack to get to and handle.

Multi-axle dump trucks are the toughest vehicles on which to "package" the cans because pusher axles take up space on the frame. Vertical stacks are the likely solution and, in some cases, the front corners of bodies may need sculpting to make room for the bulky equipment. Asphalt-hauling bodies needing exhaust heat will have to take exhaust gasses from downstream of the DPF, so under-cab fitment is likely for them. The longer the chassis and wheelbase, the easier it will be to accommodate the aftertreatment parts.

Some light trucks will have a split aftertreatment system, with the oxygen catalyst close to the engine and the DPF farther downstream. Although those two parts will muffle most noise, there'll also be a resonator to take out droning at certain engine speeds.

The resonator, slightly smaller in most cases than a present-day muffler, will be ahead of the rear axle of a pickup-type truck or crossways at the very rear of a cargo van. These systems will be hung on vehicle frames, so should present no difficulty except where power takeoffs are used. Then access to transmissions might be limited.

Midrange trucks are more complicated. Because they are fitted with a wide variety of

Volvo and Mack will use a squat "compact" DPF placed under cabs or behind the right-front wheel of some trucks. On other trucks, the devices will be in exhaust stacks.

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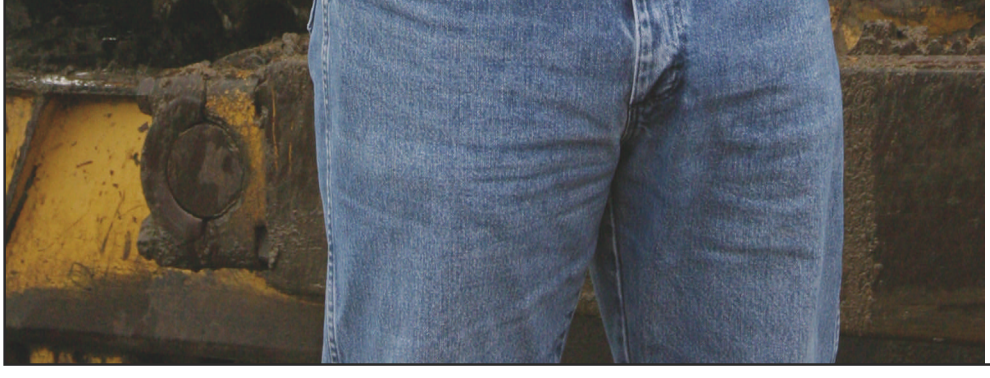

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New engines need ultra low-sulfur fuel, so current higher-sulfur fuel should not be put in the new trucks' tanks.

bodies and equipment, manufacturers will have to use a split system, as on light trucks (except for Cat's DPF-only device). But more often they'll be a single-unit can, as on heavies. Usually the can will go beneath the cab, off to the right. In some cases it will be under the steps on the curb side. The tail pipe will run rearward on the frame or up a rear corner on the cab.

Aftertreatment cans will be wired into engines' electronic control modules, which will monitor the devices' condition and order active regenerations if needed. ECMs will lower horsepower and torque if catalysts or elements get plugged, and even shut down engines in dire cases. Tampering with or removing aftertreatment devices will cause ECMs to disable engines. Technicians will thus have to learn how these circuits work and how to troubleshoot and repair them.

Exhaust systems will be "no-touch" items that may not be changed because they will be certified by manufacturers. Dealers and upfitters, who sometimes cut into and alter exhaust systems to make room for installation of special bodies and equipment, must leave the '07s alone. The only thing they can change on an '07 is the tailpipe, manufacturers say. Dual exhausts will disappear from all but high-horsepower diesels, and straight pipes will be illegal because the aftertreatment devices must remain on the trucks.

Dealers who stock bare chassis and alter them for specific applications might have to plan ahead more. Builders say they'll offer several exhaust configurations for each truck model, and the correct one for the job will have to be spec'd in the order. Manufacturers are not likely to offer kits to change exhaust configurations because that would put dealers or upfitters in the position of certifying exhaust emissions performance — something neither they nor the federal Environmental Protection Agency would want.

Training underway

Engine and truck builders say they've begun training dealer technicians on the new systems. Cat, for example, is trying to eliminate the "fear factor" inherent with new and unknown equipment by producing educational sessions on the Net and CDs, and in its closed-circuit TV broadcasts. All builders have begun printing special literature and training materials, and are preparing to put special tools in dealers' hands.

They say they've also tried to minimize the number of tools needed for servicing. The compressed-air cleaning machine, for example, is a generic design usable for all DPFs. One model is built by tool maker SPX, a name familiar to shop people. It runs on 110-volt power and standard shop air, sits on rollers so it can be moved among service bays, and costs several thousand dollars. Only large truck fleets are expected to buy these machines, as most operators will let dealers handle this specialized maintenance.

Wait 'til 2010

If you think these changes are major, wait until 2010, say the manufacturers. Even stricter diesel emissions limits are scheduled for then, and will require more equipment and more money. The most likely aftertreatment system will inject an additive into the exhaust stream to further cleanse it of pollutants. Such systems are now working on diesels in Europe. Stay tuned. CE

PCVs and Oil Drains

Positive crankcase ventilation systems will be part of 2007 diesel engines, and they will have their own filters. Some will need periodic, though infrequent, cleaning, which might be done every third or fourth oil change. Others will need no maintenance. As with exhaust-gas recirculation systems, hardware in the PCV system should be looked at regularly to ensure integrity and proper operation. A plugged EGR valve can shut down a diesel and puzzle its driver unless he knows what it is and sees that it gets cleaned out.

Oil-drain intervals will in most cases be the same as for current engine models, according to the builders, who've gone to great pains to ensure this aspect of performance. This is due to low-sulfur diesel fuel and low-ash CJ-4 motor oil, which will help keep engines and the oil itself clean. And a few engines will have larger sumps or oil pans to lengthen intervals.

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New Engines, New Looks Included in '07 Models

Motor vehicle model years usually start in the spring or summer preceeding the calendar year for which they're named. Thus, 2007-model vehicles are already being built, but manufacturers will put a new batch into production beginning in January. These get the '07 diesels described in the preceding story. The trucks have been re-engineered to accommodate the new engines, and many have undergone extensive studies and tests on underhood airflow as a way to help cooling systems remove excess heat from cylinder blocks and accessories.

High heat levels — sometimes measured at hundreds of degrees — began being a problem as diesel operating temperatures climbed so they could burn cleaner. The problem became acute with diesels made to meet the October '02 deadline, and suppliers had to devise more robust materials for hoses and wiring, and accessories like alternators and fluid bottles for windshield wiper washers. Many '07 diesels will run even hotter, so some trucks will get bigger radiators to handle the heat and wider frame rails to mount them.

Some manufacturers have turned the engine situation into an opportunity to restyle exteriors and upgrade interiors. Some changes are easily spotted and others are subtle. But given the extensive work and money invested in them, they are different enough to merit being set apart from what came before. Perhaps we should call them "07-1/2"models. Anyway, here are succinct descriptions of the upcoming Class 8 vehicles.

FREIGHTLINER

Freightliner's FLD is gone as a highway tractor, but thanks partly to a long-running military contract, an SD (severe-duty) version (shown) remains. It's supplemented by a Business Class M2V (for vocational) model, which includes a Class 8 variant. Freightliner's own 14-liter Detroit Series 60, with ratings of 455 to 515 horsepower, is standard in most long-hood trucks and tractors, while the 12.8-liter MBE 4000, rated at 350 to 450 horsepower, is standard in most vehicles with medium-length hoods. Its Class 8 engine vendor is Caterpillar, which will supply 335- to 430-hp C13 and 435- to 625-hp C15 diesels for certain Freightliner models. The Condor heavy-duty, low-cabover is no longer offered, as it went with the American La France factory and product line that Freightliner sold earlier this year.

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GENERAL MOTORS

GMC TopKick and Chevrolet Kodiak (shown) midrange conventionals and T-series tiltcabs become Class 8 models when built with heavy-duty axles, suspensions, brakes and other appropriate chassis parts. Later in '07, the C8500 will be available with a Meritor 18,000-pound-capacity front axle (2,000 pounds higher than the current heaviest steer axle), primarily for municipal business. A Dana 46,000-pound tandem (versus 45,000 now) on a Hendrickson Haulmaxx rubber suspension will also be a new option. Standard power for C8500s is the 7.8-liter Isuzu 6H (formerly called the Duramax 7800), rated at 215 to 300 horsepower, with aftertreatment and other changes for '07. Caterpillar's C7, at 207 to 300 horsepower, is a $1,000 option. The 325-hp, 8.1-liter Vortec 8100 V-8 is also available, making GM the only builder to offer gasoline power in Class 8. The '07-spec Isuzu 6H diesel is the only engine available in T8500s, which are otherwise unchanged.

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INTERNATIONAL

International's 7700 (below), powered by Cat or Cummins big-bore engines, gets a taller hood to house bigger radiators — probably the most visible change to any of the '07-model vocational trucks or highway trucks. The 5000i vocational vehicles now carry the PayStar name that had been dropped several years ago. It's part of the builder's return to once-popular Star-suffixed monikers for a number of models. Cat's C13 and C15 and Cummins ISM and ISX are the largest engines in Class 8 models; Cummins' ISL will be the lightweight engine in certain heavy applications, and its own DT and HT 570 and DT 466 will go in others. Later in '07, the MaxxForce heavy-duty diesels developed with MAN of Germany will debut.

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INDIANA PHOENIX

Phoenix front-discharge concrete mixers are the specialty of this niche builder, which produces models with three to seven axles. It also offers water tank and "slinger" bodies on its front-cab, rear-engine chassis. Sometimes half of Indiana Phoenix's production is glider kits, which come as new frames, cabs, wiring, suspensions, tanks, fenders and mixer bodies with customers' powertrains and axles; a kitted mixer costs about half the price of a new truck. The company expects interest in gliders to grow as customers become more aware of higher prices for new trucks starting in January. Engines planned for '07 are Cummins' ISM and Cat's C13, mated to Allison RDX automatic transmissions.

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Class 8 Trucks

VOLVO

VHD (above) continues as Volvo's vocational truck, and will come only with a new D13 diesel, rated at 335 to 485 horsepower. The high-hood VT800 tractor can be ordered with the '07-spec Volvo D16, with 450 to 600 horsepower (but with "only" 2,050 pounds-feet, as the 2,250-lbs.-feet version is being dropped); also available in the VT are various ratings of the Cummins ISX. New mid-roof sleepers for VT/VN tractors might interest long-haulers of construction supplies using flatbed trailers; sleepers are 2 feet shorter to better match load heights, and weigh less than high-roof sleepers. The D13 and lighter-weight D11, with 325 to 405 horsepower, will replace the D12 starting in January. New D engines will be similar to Mack's MP series and will be built by Volvo Powertrain in Hagerstown, Md.

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OSHKOSH

S-Series rear-engine, front-discharge mixer chassis (above) is an integrated product using mixer bodies from McNeilus, an Oshkosh subsidiary, with steel drums or lightweight Revolution composite drums. S's can be ordered with a variety of axle configurations, and are built as new or glider-kitted trucks. Extensive experience in building military trucks went into the design of the Highland, Oshkosh's tall conventional-cab model using rear-discharge McNeilus mixers. Highland is available as a 6x6 or 6x4, the latter with an independent front suspension. Cat's C13 and Cummins' ISM are the chosen '07 diesels for both truck series.

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TEREX ADVANCE

Terex front-discharge, rear-engine mixers (formerly called Advance and Riteway) are offered with three to seven axles for use in states with varying weight laws. The builder also "glider kits" trucks using new cab and chassis components with customers' powertrains and axles. Cummins ISM and Cat C13 diesels are the '07 engines, and are mated to Allison RDX automatic transmissions. One-third of Terex Advance's new-truck production involves building and installing its own rear-discharge mixer drums on new conventional-cab chassis of various makes.

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MACK

In preparing for '07, Mack upgraded its conventional-cab vocational and highway vehicles, and all models, including the MR and LE low-cab-forward vocational trucks, will have only Mack diesels. The Granite (above) gets a 4-inch-longer cab with new interior features, and a roomier and fancier Pinnacle replaces the Vision and CH highway models. Mack Power diesels, like those for sister company Volvo Trucks, were designed by Volvo Powertrain and will be built in Hagerstown, Md. First is an 11-liter MP7, which is now offered without '07 aftertreatment equipment in certain Granites; in January the MP7 gets aftertreated. Later in '07, a 13-liter MP8 will debut. The MP7 has ratings of 325 to 405 horsepower and the MP8 will go from 425 to 485. The MP engines will come in Maxidyne, MaxiCruise and Econodyne versions. Mack says MPs are more fuel efficient than current ASET engines (which will be gone by year's end), and have unique parts, controls and operating characteristics to differentiate them from Volvo Trucks' versions.

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KA02

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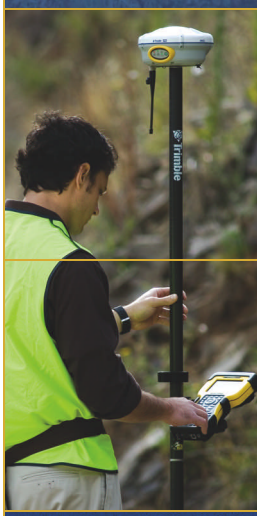

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THE MIRAGE • LAS VEGAS

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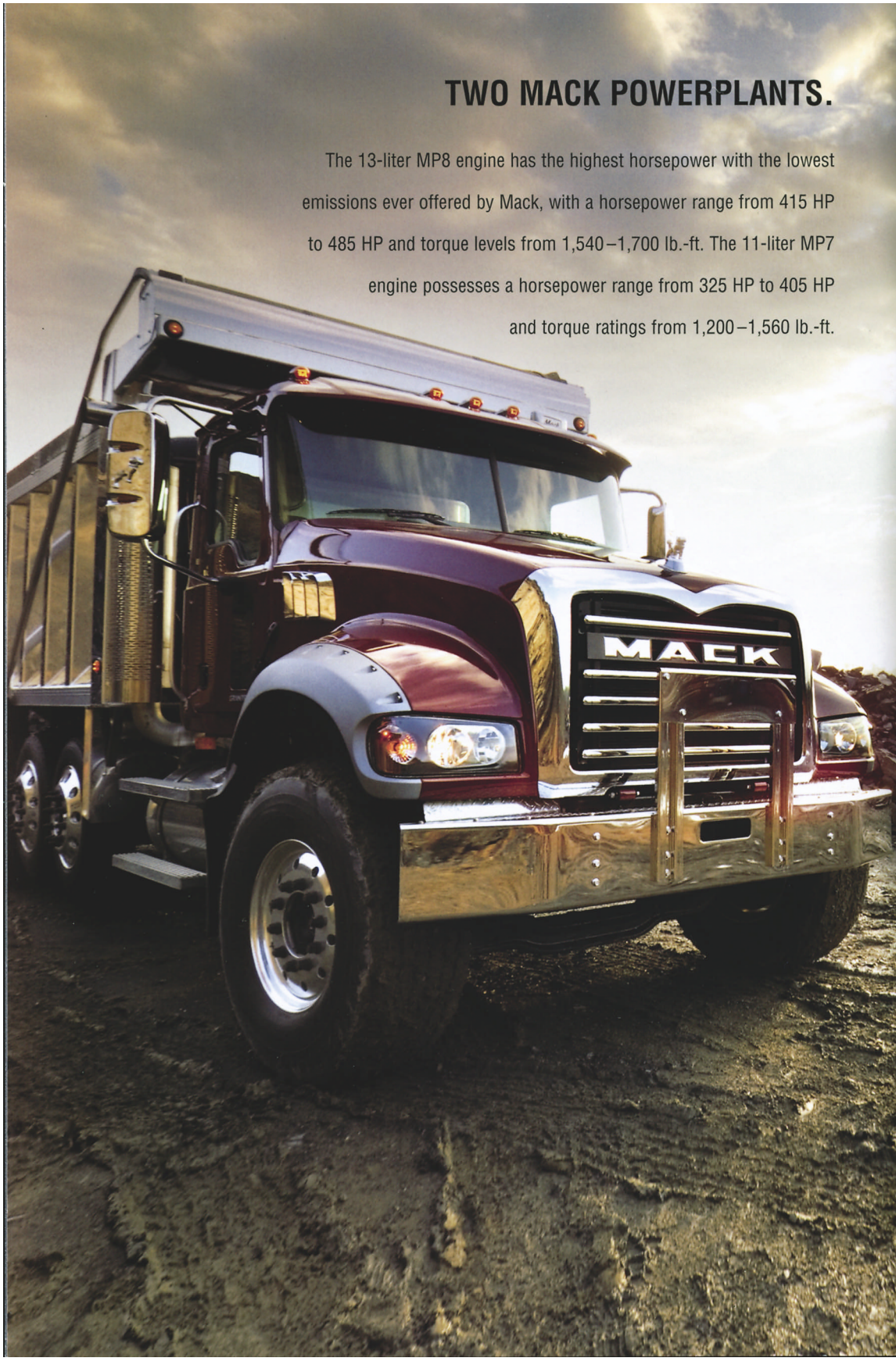
MACK POWER UNLEASHED.

ALL SCIENCE. NO FICTION.

RUNS HARDER. RUNS LONGER. RUNS CLEANER.

Engineered with the power, torque and durability you expect from Mack®, the all-new MP7 and MP8 engines, the latest members of the Mack MP™ Engine Series, draw on proven technology to boost power and run cleaner. These engines deliver the performance and versatility you need while meeting the strict emissions requirements of the EPA for 2007.

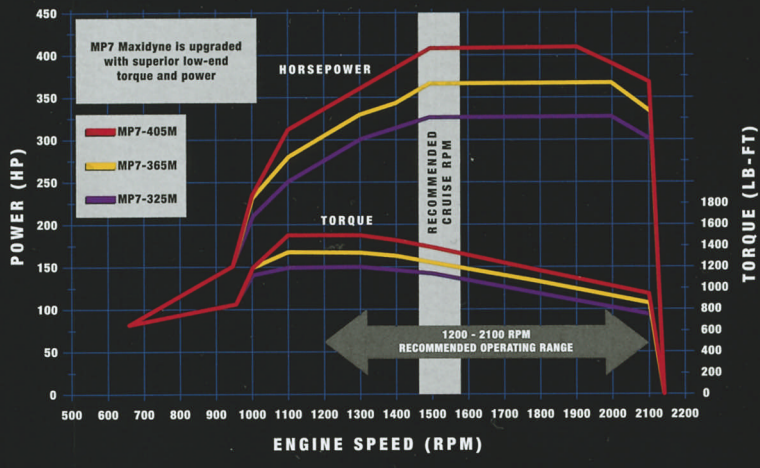
MACK



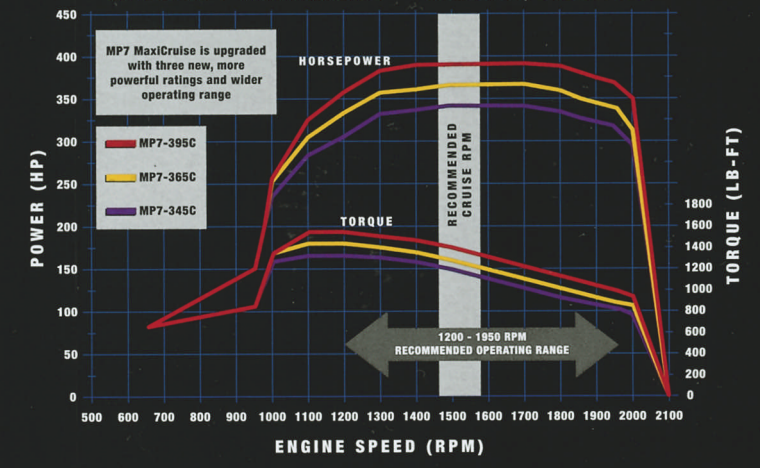
TWO MACK POWERPLANTS.

The 13-liter MP8 engine has the highest horsepower with the lowest emissions ever offered by Mack, with a horsepower range from 415 HP to 485 HP and torque levels from 1,540–1,700 lb.-ft. The 11-liter MP7 engine possesses a horsepower range from 325 HP to 405 HP and torque ratings from 1,200–1,560 lb.-ft.

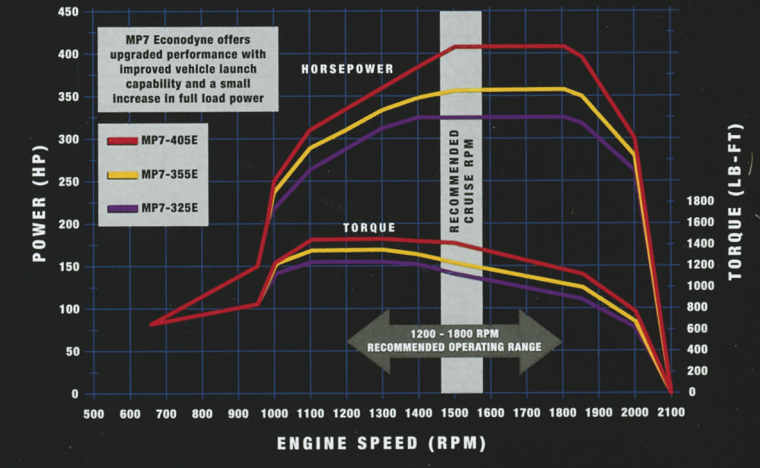
MACK MP7 MAXIDYNE — ALL VOCATIONAL OFFERINGS



MACK MP7 MAXICRUISE — GRANITE, PINNACLE



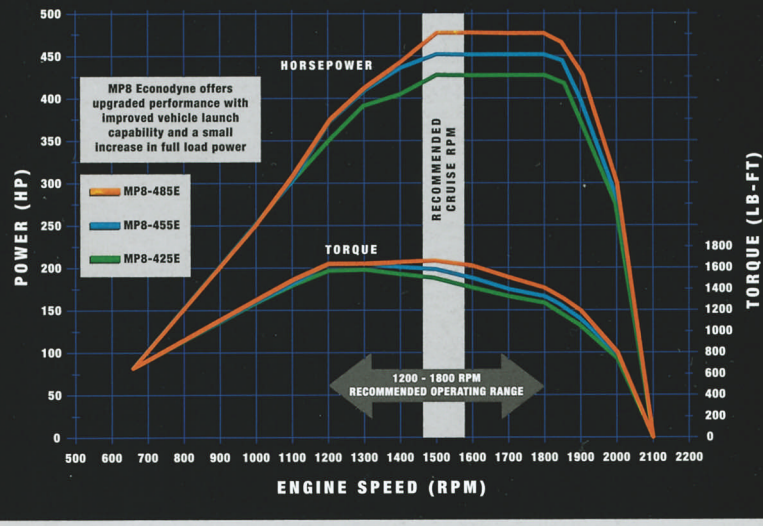
MACK MP7 ECONODYNE — PINNACLE



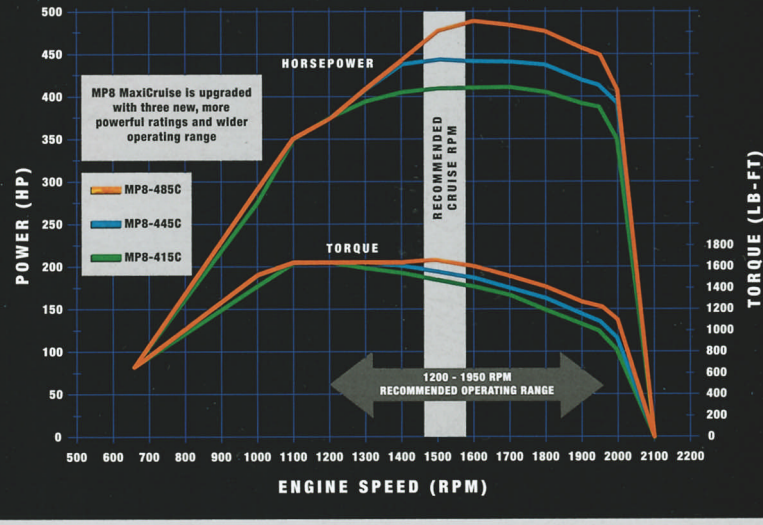
LOG MORE MILES WITH LESS STOPS.

These all-new engines maintain the injection and air management system that was introduced with the MP Engine Series to achieve better fuel economy, and as a result, we anticipate up to a 3 percent increase for highway applications and a 6 percent increase for vocational use.

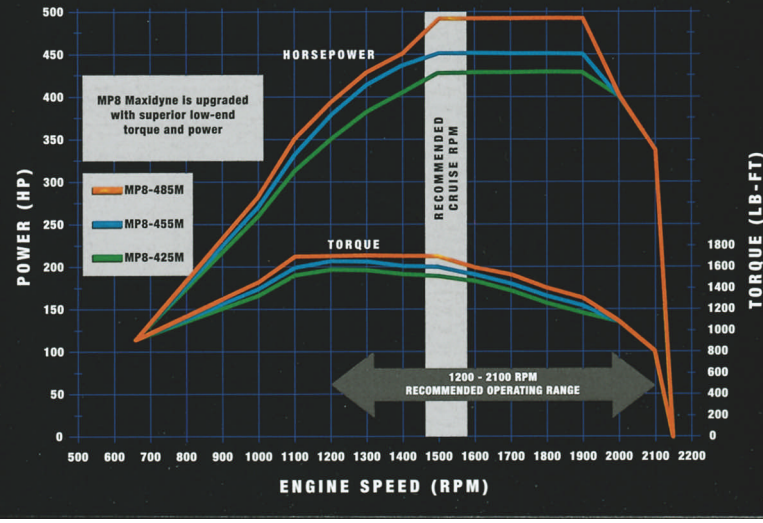
MACK MP8 ECONODYNE — PINNACLE



MACK MP8 MAXICRUISE — GRANITE, PINNACLE



MACK MP8 MAXIDYNE — ALL VOCATIONAL OFFERINGS



FULLY LOADED.

These state-of-the-art engines feature single overhead cams and electronically controlled ultra-high-pressure fuel injection, and are built to last with one-piece steel pistons and stronger bearings and cylinder heads.

THE EXHAUST GAS RECIRCULATION (EGR) COOLER was redesigned with a tube-and-insert configuration for even more efficient cooling.

THE NEXT-GENERATION, ELECTRONICALLY CONTROLLED VARIABLE GEOMETRY TURBOCHARGER incorporates the latest technology to cool both the turbo and actuator.

THE MACK POWERLEASH™ engine brake provides more braking horsepower through mid-RPM ranges.

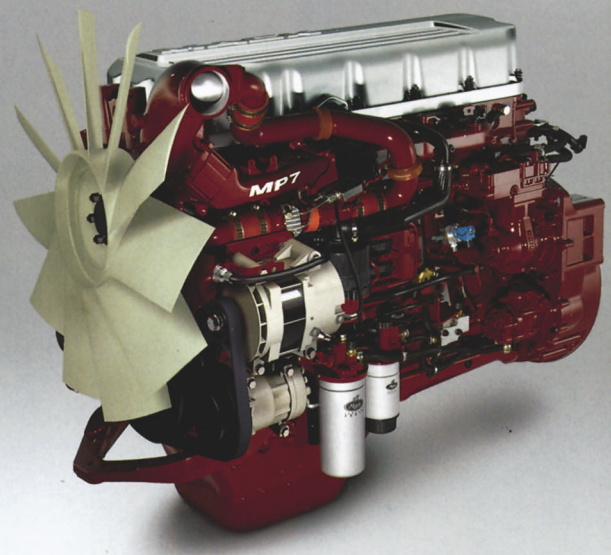
THE MACK GUARDDOG® preventative maintenance monitor combats unplanned downtime by using real-time sensors to deliver accurate data to reduce downtime and boost efficiencies.

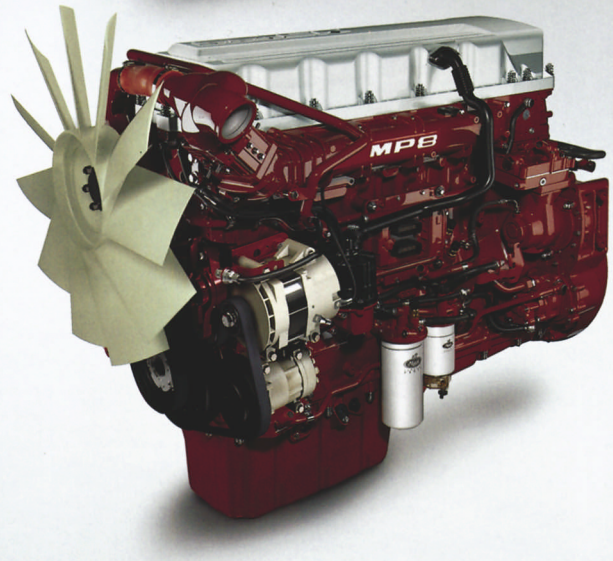
DESIGNED TO RUN EXCLUSIVELY WITH ULTRA LOW SULFUR DIESEL (ULSD), which uses only 15 ppm (parts per million), these engines will not meet emissions standards using pre-2007 diesel fuel (500 ppm). Improper fueling will reduce effectiveness and poison the Diesel Particulate Filter.

OUR VEHICLE MANAGEMENT AND CONTROL SYSTEM (V-MAC® IV) offers hundreds of programmable features to help you gain control of your costs and monitor your truck and engine better than ever.

THE BASE MACK WARRANTY is 3 years/300,000 miles on the MP7 and MP8 engines. Extended Bulldog Protection Plans® can be tailored to meet your needs.

MAXIDYNE®, MAXICRUISE® AND ECONODYNE® are the same engine families that optimize performance in a wider operating range. Each matches current transmission offerings.





MAXIDYNE®	
ENGINE	HP
MP7	325M
MP7	365M
MP7	405M
MP8	425M
MP8	455M
MP8	485M
ENGINE TORQUE LEVELS	
MP7: 1,200–1,480 lb.-ft.	
MP8: 1,540–1,700 lb.-ft.	

MAXICRUISE®	
ENGINE	HP
MP7	345C
MP7	365C
MP7	395C
MP8	415C
MP8	445C
MP8	485C
ENGINE TORQUE LEVELS	
MP7: 1,350–1,560 lb.-ft.	
MP8: 1,560–1,660 lb.-ft.	

ECONODYNE®	
ENGINE	HP
MP7	325E
MP7	355E
MP7	405E
MP8	425E
MP8	455E
MP8	485E
ENGINE TORQUE LEVELS	
MP7: 1,260–1,460 lb.-ft.	
MP8: 1,560–1,660 lb.-ft.	

SETTING THE STANDARD.

As an integrated truck and engine manufacturer, we were able to seamlessly incorporate Diesel Particulate Filters (DPF) into our exhaust system with a technically savvy solution that allows trucks to run cleaner without sacrificing any benefits of the MP Engine Series.

Mack Back-of-Cab DPF

MackCap™ DPF

THE DPF IS DESIGNED IN THREE UNIQUE CONFIGURATIONS to fit the needs of each truck: Mack Back-of-Cab Catalyzed and Non-Catalyzed DPFs and a compact MackCap Catalyzed DPF.

THE DPF REDUCES PERMISSIBLE PARTICULATE MATTER (PM) emissions by more than 90 percent from US'04 levels.

THE CATALYZED DPF uses existing exhaust heat to passively oxidize soot and a simple, seventh injector to supply hydrocarbons (diesel fuel) to actively oxidize remaining soot collected in the filter through a catalytic reaction.

THE NON-CATALYZED DPF (Residential Refuse Solution) uses a Thermal Regenerator to supply the necessary heat to oxidize the soot collected.

EACH DPF CLEANS ITSELF THROUGH REGENERATION. The DPF does require service cleaning at 150,000-mile intervals for highway applications or approximately 4,500 hours for vocational applications.

WHEN SERVICING THE DPF, the filter is removed, cleaned and reinstalled. The DPF is designed to last the life of the engine.

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PETERBILT

Extensive changes for '07 engines have caused Peterbilt to re-style most of its Class 8 models and give them new designations. The vocational 365 and 367 (shown) replace the current 357 and 378 truck. And Model 340 joins the 335 as Peterbilt's "heavy 7" offering. The traditionally styled long-nose 389 with smoother exterior styling replaces the current 379 (a common dump-truck model on the West Coast), and the medium-nose 388 replaces the 378 tractor. The aerodynamically styled medium-hood 384 and 387 day cab join the long-hood 386 to complete Peterbilt's aero truck lineup. Long-nose Class 8 vehicles will use the 15-liter Cummins ISX, from 385 to 565 horsepower, and Cat's C15, from 435 to 625 horsepower, while medium-nose will have the 11-liter Cummins ISM, from 280 to 450 horsepower, and Cat's C13, from 335 to 430 horsepower. Cummins ISL and Cat C9 diesels will continue as lightweight options. As with Kenworth, Peterbilt's medium- and medium-heavy models will use a new series of Cummins-built 6.7- and 8.3-liter diesels, called PX-6 and PX-8, respectively. Cat's C7 is being dropped.

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STERLING

All Sterlings get revised pedal designs and all pedals are suspended. A-Line cabs are standard with air-bag rear supports and air conditioning. The midrange and Baby 8 Acterra is now available with an extended cab, with rear seats or bunks and cargo access doors, and the four-door crew cab Acterra can be ordered with power windows and locks. As part of the Freightliner family, Sterling will use 14-liter Detroit Series 60 engines as standard in its A- and L-Line (right) 9500 models. Depending on the BBC-configuration, the 12.8-liter MBE4000 and Caterpillar C13 and C15 diesel engines will be available as options. Power ratings will be the same as with Freightliner trucks. L- and Acterra models designated 8500 will be standard with 7.2-liter MBE 900 diesels rated from 190 to 330 horsepower; Cummins' 8.3-liter ISC with up to 315 horsepower will be optional.

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WESTERN STAR

The 4900 series (above) is often built for vocational duty, and the extra-heavy-duty 6900 is more at home off-road than on. As part of the Sterling organization, Western Star will use the Detroit Series 60 in its 4900 FA and SA models, with the MBE 4000 and Cat C13 and C15 engines as options. The 6900XD will have the Series 60 engine as standard and the Cat C15 as an option. 'Stars have enough room in the radiator area of their hoods to accommodate larger cooling packages for '07, so unlike some trucks, their frames didn't have to be modified to accept them.

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KENWORTH

Kenworth's T800 (below) is optional with Big Power ratings — up to 625 horsepower — of Cat's C15, which were formerly limited to the W900. Bendix Spicer air disc brakes on steer and drive axles will be optional on certain truck and tractor models (they were offered on T2000 steer axles only). Extensive underhood changes for '07 engines include larger cooling packages, revised radiators for most models, and standard silicone hoses and extended-life coolant. KW's heavy diesel offerings include Cummins ISL, ISM and ISX, and Cat C9, C13 and C15. The medium-duty T330 will use a new series of Paccar-branded, Cummins-built 6.7- and 8.3-liter diesels, called PX-6 and PX-8. Cat's C7 is being dropped.

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CONSTRUCTION EQUIPMENT EXCLUSIVE FIELD REPORT

Eleven Chances To Hit the Right Gear

CE visited Volvo on its home turf for motor graders to learn first-hand what experienced operators might think of the company's new 11-speed transmission

G900 SERIES TRANSMISSIONS

REPORT FIELD REPORT FIELD REPORT

By WALT MOORE, Senior Editor

Between the two of them, George McHattie and Gord Diamond have more than 70 years operating motor graders. We figured that kind of experience qualified them to help us with an experiment of sorts that Volvo and *Construction Equipment* devised for comparing the company's new 11-speed motor-grader transmission with its also-new (but more conventional) 8-speed counterpart. Both of these new powershift transmissions, specifically engineered by Volvo for its new G900-Series motor graders, are direct-drive countershaft types, but one uses 8F/4R gearing, while the other's configuration is 11F/6R. Do more gears yield advantages on the jobsite?

That's where McHattie and Diamond came in. We enlisted their help to answer that question from an operator's point of view. Our guest operators used two G940s, one with an 8-speed and the other with an 11-speed transmission, to grade gravel on a county road; trim road-base limestone in a housing development; hog out dirt in a ditching exercise; and to high-tail it between jobsites in Goderich, Ontario's, morning traffic. (On the eastern shore of Lake Huron, Goderich is home for Volvo's motor-grader operations.)

Also assisting in this effort were Trimble Navigation's Mike Read, Kent Kahle and Rod Elliott, who equipped the G940 test units with a total-station grade-control system and a sonic-tracer system. The intent with these systems was to keep blade depth comparable between the two units when working in the same material, thus eliminating depth-of-cut as a factor in the operators' perceptions of machine performance. Representing Volvo Construction Equipment were Brian Lowe, product and communications manager, and Russell Sharpe, demonstration operator — and former contractor with 30-plus-years experience on motor graders.

The G940 units that McHattie and Diamond put to work in Goderich this past June are second in size in Volvo's new G900-Series lineup, which includes five tandem-drive models (G930, G940, G960, G970, G990) and two all-wheel-drive models (G946 and G976). These machines range in base operating weight from around 34,000 to 46,000 pounds, and in maximum net horsepower from 195 to 265. The new model range supersedes Volvo's B-Series models (introduced in 2002), which served the company well by helping extend its reach into the private-contractor and county/municipal market segments. But with the introduction of the completely redesigned G900-Series, Volvo seems to have attained its ultimate motor-grader goal, namely, developing a premium range of models with broad market appeal and with features that provide a measure of product distinction in a crowded marketplace.

And in a world where eight speeds are considered the norm, the G900-Series' new 11-speed transmission qualifies as one of those distinctive features.

In the gravel-road-grading evaluation, the 11-speed transmission's 5th gear provided a workable intermediate speed that was an estimated 0.6 mile per hour faster than the 8-speed's 3rd gear, but 0.7 mile per hour slower than the 8-speed's 4th gear, which the operators considered too fast for the application.

Photos: George Pfoertner©

George McHattie, just recently retired, worked for Gottardo Construction in Toronto, Ontario. He's been operating motor graders for 40-plus years.

Gord Diamond, with 30-plus years as an equipment operator, works for Rankin Construction in St. Catharines, Ontario.

The 11-speed Volvo G940 posted a 9-percent time advantage, compared to its 8-speed counterpart, when making a nearly 7-mile, top-speed run from the Volvo factory to the jobsite.

Both operators agreed that when grading this gravel road, the 11-speed provided smoother overall operation, especially when changing gears.

One of our Volvo G940 test machines makes a careful pass along a freshly poured curb. The G940's all-wheel-drive counterpart, the G946, has a front-wheel-drive-only feature — designed for grading in confined spaces, where using the tandem might scuff the surface.

Fine–tuning speed and torque

You don't have to hang out with good motor-grader operators too long before you pick up on the fundamentals of using the machine. And among those basic principles is that of matching an appropriate transmission gear to an appropriate engine speed to keep the machine moving smoothly on the grade. The right balance means having enough torque to do the job (but not so much as to risk spinning the wheels and marring the grade), yet also having enough speed to work at a reasonable pace without the engine constantly bumping up against maximum speed.

To help operators more easily find and maintain this balance, says Volvo, the G900-Series combines new transmission technology with new engine-management technology. Efficiently managing the engine's power complements the capability of the new 8-speed transmission, says the company, but works exceedingly well with the 11-speed.

Whether the engine in a G900-Series machine is driving an 8-speed or an 11-speed, it is programmed to produce three power bands, which deliver a different net horsepower rating for specific gearing groups. For instance,

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the 8-speed G940, with the engine at 2,100 rpm, produces 175 horsepower (F1, F2, R1), 195 horsepower (F3, F4, F5, R2, R3) and 215 horsepower (F6, F7, F8, R4). The 11-speed G940 has identical horsepower ranges, but adds an extra forward gear in each of the three power bands, plus an extra reverse gear in the low and high bands.

According to Volvo, the system provides a fairly precise speed/torque match in applications that typically would fall within a gearing group. But it also provides operators the means to fine-tune these parameters. The panel-mounted Throttle-Control rocker switch, for instance, allows the operator to quickly raise or lower engine speed in set increments. The Throttle-Mode switch functions as an engine-speed cruise control, allowing a selected rpm setting to be maintained without the foot throttle — and also allowing the setting to be cancelled (or not cancelled, if the operator so chooses) via the inching pedal.

The smartest switch in the cab, however, is that for Engine Mode. Using this control, the operator can toggle at will between a Power and a Speed setting to actually change the engine's torque curve when it's running in either of its two lower horsepower bands.

In Power setting, intended for grading operations, engine speed is capped at a maximum 1,900 rpm and, according to Volvo, torque gets a boost, fuel consumption diminishes, and sound levels drop significantly. In the Speed setting, the engine changes its torque curve for more efficient operation at higher ground speeds.

Fuel Consumption (8-Speed versus 11-Speed)

Volvo makes the case that more transmission speeds allow operators to better match engine rpm to the task at hand, resulting in reduced engine speeds and lower fuel consumption. Also, says the company, the Volvo engine's ability to produce high torque at relatively low speeds "encourages the use of a higher transmission gear, because drivability and lugging power are not sacrificed." To test these claims, Volvo delivered a G940 motor grader and two transmissions, an 8F/4R model HTE840 and an 11F/6R model HTE1160, to the University of Nebraska's Tractor Test Laboratory, which has provided vehicle-performance and fuel-consumption testing since 1920. The object was to evaluate the G940's fuel consumption under simulated operating conditions with the 8-speed transmission, then with 11-speed. Using the same machine and swapping transmissions, says Volvo, eliminated a host of other variables.

During the evaluations, the motor grader maintained a constant ground speed while towing a test vehicle that provided a constant load. Both the 8-speed and the 11-speed were used in two simulated work applications, and multiple runs with each transmission helped established consistency.

According to test-summary data that Volvo provided, the simulated applications involved ground speeds of 2.2 and 9.0 mph, and corresponding drawbar loads of 4,500 and 3,500 pounds. In each instance, the 11-speed-equipped machine used less fuel, by 5.7 and 6.4 percent, respectively.

Overall, the G940 equipped with the 11-speed transmission delivered an average fuel-efficiency advantage of 6.1 percent under controlled conditions.

11-speed logic

Buyers have three transmission choices for G900-Series models, and the logic behind the choices, says Volvo, is having the ability to closely match features to customer requirements. As noted, all transmission choices are direct-drive, countershaft, powershift models, and all use pulse-width modulation (PWM) of their hydraulic clutches. PWM is essentially electronic regulation of the clutch's engagement and disengagement interval, with the aim of smoothing the transition from one gear to another.

The standard transmission is the Manual-Mode 8-speed (model HTE840). This choice allows shuttle shifting (on-the-move directional changes without using the inching pedal), remembers the operator's preferred gear coming out of a directional change, downshifts automatically and affords over-speed protection.

An optional 8-speed adds two features to the standard transmission: Auto-Mode, which, essentially, automatically shifts up or down between a base gear and a selected upper gear; and Travel-Mode, which shifts the transmission (automatically) more rap-

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Volvo's Russell Sharpe confers with one of the guest operators about using the G940 to trim the grade on a new residential street.

idly for faster acceleration to top speed when traveling between jobsites.

The third choice, the 11-speed model HTE1160, is optional for all G900-Series motor graders and combines all manual-mode, Auto-Mode and Travel-Mode features with the addition of three extra forward gears and two added reverse gears. If you compare ground speeds for matching gears in a G940's 8-speed and 11-speed transmissions (with the engine running at 2,100 rpm), you'll find the 11-speed a bit slower. In 1st gear, for example, speeds are 2.7 versus 2.1 mph, respectively. Eighth-gear speeds are 28.4 versus 14 mph, respectively. But the 11-speed continues to notch up to 18.2, 23.8 and 30.8 mph in its three remaining gears.

Correspondingly, when the engine is running at peak-torque rpm in a particular gear, the 11-speed transmission again yields lower ground speeds. In gears one through five, for instance, ground speed varies from 1.4 to 5.9 mph for the 8-speed, and 1.1 to 3.5 mph for the 11-speed. If the machine is being operated in the Engine-Mode's Power setting, then ground speed will be reduced approximately 10 percent from the rated-speed number.

The net results of the 11-speed transmission's performance characteristics are that it provides a lower first gear, a higher top gear, and smaller steps in ratio between gears along the way. This latter characteristic, according to Volvo, accounts for much of what the company considers the refined performance of the 11-speed.

So, how does all this translate to the jobsite?

What the experts think

The first comparison of the two G940s was a 6.9-mile trek from the Volvo factory to a stretch of gravel road that had been temporarily closed for our purposes. Both transmissions were used in their fast-shifting Travel Mode, and Volvo's Sharpe made sure that tires were all equally inflated and that fuel levels were the same.

We started the watch on each machine as it pulled onto the paved secondary road that led to the jobsite, and stopped timing when the machines, still at full speed, passed a designated spot just before the jobsite turnoff. We found the 11-speed G940 just slightly more than 9 percent faster than its 8-speed counterpart.

For the two grading exercises (the county road and the housing development), the operators generally ran the machines at between 1,200 and 1,400 rpm. When grading on the gravel road, the machines made multiple 1,000-foot pushes at depths that averaged probably 1.25 inches. On these pushes, the Engine-Mode switch in both machines was in its Power setting.

After each operator had run both machines, they told us that they had run the 8-speed in 3rd gear and the 11-speed in 5th gear. Assuming that the rpm setting at which the units were operated placed the engines near their peak-torque rating, then we can estimate that ground speed was approximately 3.5 mph for the 8-speed and 4.1 mph for the 11-speed. To give just a bit more context here, the 8-speed's 4th gear, peak-torque ground speed would have been 4.9 mph, apparently too fast for this situation in the opinion of both operators.

The approximate half-mile-per-hour production advantage for the 11-speed (4.1 versus 3.5) may be less noteworthy, however, than what both operators considered the 11-speed's superior performance characteristics. Diamond summed up the consensus of opinion:

"After running both machines, it was apparent that the 11-speed shifted more smoothly. By comparison, the 8-speed had a tendency to lurch a bit between gears, and I used the inching pedal to try to smooth out the shifts. But I didn't use the inching pedal with the 11-speed. You get some wheel bounce between shifts with the 8-speed, and this will create a washboard if you don't work to prevent it."

According to McHattie, the 11-speed helped simplify the chore of selecting a gear that would accommodate

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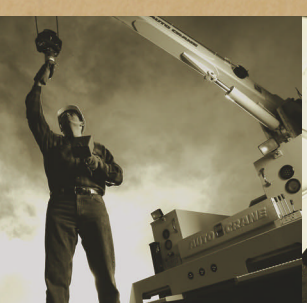

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changes in operating conditions:

"If you're running in a low gear and hit a hard spot or a rock, chances are that you'll have so much torque that the wheels will spin. But if that happens in a higher gear, then you'll lose power. The object is to find the gear and the engine speed combination that will give you a fairly constant push. I don't have much experience with an 11-speed transmission, but in this application, I'd say that it makes finding the right gear much easier.

Gord Diamond makes a heavy push during the ditching exercise. Our other guest operator, George McHattie, used the G940's control features to advantage during this exercise: "I didn't once touch the foot throttle or the inching pedal when making turns at the end of the ditch. I planted my feet on the floor and used the panel switch for engine speed and made directional shifts without the inching pedal. Very nice features."

Other sites, other observations

The next stop was a new housing development, where the contractor on site had spread limestone base for the street, which already had the curbs in place. Basically, our two operators were just dressing the surface of the grade, but did enough work to form some opinions about the differences in machine performance.

Both men agreed that when working near the curb reveal, the lower ground speed of the 11-speed transmission's 1st, 2nd and 3rd gears (running at about 1,200 rpm) provided more control than the 8-speed (running at a comparable rpm setting). According to Diamond, the 8-speed machine "was getting a little bouncy in 3rd range."

Again, assuming that ground speeds for the two machines approximated Volvo's published numbers for peak-torque speeds, we'd estimate that working speeds in 1st, 2nd and 3rd gears for the 8-speed were 1.5, 2.1 and 3.5 mph, and those for the 11-speed 1.2, 1.5 and 2.1 mph. We got the impression from the operators that the 11-speed, with relatively small steps between the lower gears (compared to the 8-speed), goes about its fine-grading duties in a much calmer fashion.

Perhaps the application in which McHattie and Diamond found the most difference between the 8-speed and 11-speed was the ditching exercise. Both used each machine to cut a 200-foot-long, reasonably steep ditch in multiple passes. Both machines were operated with their Engine Mode switches in the Power setting.

"I was running at full throttle and found that 2nd gear in the 8-speed was too slow," says Diamond, "but 3rd was too fast. So I ran in 2nd. But in the 11-speed, I could work comfortably in 4th. The 11-speed gives you what I'd call 'half-gear' steps, which allow you to operate in a smoother fashion."

(Since the Engine Mode's Power setting reduces ground speed by about 10 percent from ground speed at rated engine rpm, then we'd estimate that the 8-speed was moving at about 3.4 mph in 2nd gear and 4.7 mph in 3rd. By comparison, the 11-speed would have been moving at about 4.2 mph in 4th. This approximate half-mile-per-hour spread in ground speed (4.2 versus 4.7) apparently made a notable difference to Diamond in this application, allowing him to actually run faster in the 11-speed and, as a result, to be more productive.

McHattie, like Diamond, found that he worked comfortably using a higher gear in the 11-speed:

"With the 11-speed, you seem to be able to find that spot where the machine really wants to push, rather than spin. I wouldn't have expected that shortening the ratios by adding three gears would make such an apparent difference."

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By LARRY STEWART, Executive Editor

Prepare to Work Safely From Work Platforms

Site assessments, machine inspections, and safety gear are simple keys to avoiding accidents with aerial-work platforms

Aerial-work platforms are typically used by people who are trained in the trades — iron workers, welders, masons, etc. The machine is a means to reach their work, and operating it is secondary to their trade. That's why the industry — OSHA, ANSI, ISO, lift manufacturers, and others — is working to train operators.

Aerial-work platforms (AWPs) are fairly simple, stable machines but because they raise people to heights, there is inherent risk in their operation. Mike Popovich, training director at JLG says his company's trainers start with an approach to teaching accident avoidance for all equipment operators that asks five important questions:

Five Steps to Safe Machine Operation

1. **Walk-around inspection** — Is the unit safe, mechanically?
2. **Worksite assessment** — Is it safe to operate on the work site?
3. **Function test** — Does the unit function safely?
4. **Proper operation** — Am I operating safely?
5. **Proper shutdown** — Is the unit in a safe place and shut down properly?

Essentially, all operators' manuals explain how an operator should answer each of these questions for each make and model of machine. The intent of this story is not to repeat all of that detail, but to focus on some of the key safety issues common to AWPs.

Worksite assessments are particularly important on changing construction sites because of the risk of contact with power lines or crushing obstacles, and because of the risk of tipping on unimproved surfaces.

Walk around the site to check ground conditions. You're looking for uncompacted fill, holes or ditches, cellars and basements. Make sure any floor or other structure you'll be driving over is strong enough to support the machine's weight (individual tire loads should be marked on the machine, just above each tire).

Weather conditions play a role in AWP stability. Underfoot conditions that were safe when the site was dry in the morning could become dangerously unstable in the afternoon, after a rain.

Don't use a lift in winds greater than 28 miles per hour. Unless someone has an anemometer handy, this is an operator's judgment call. Aerial Work Platform Training Inc., the training subsidiary of an independent AWP-safety organization backed by most equipment manufacturers, recommends using the Beaufort Scale for estimating wind force. This scale describes winds in the 28-mph range as a strong breeze capable of putting large tree branches in motion. The wind may whistle over power lines, and umbrella users have to be careful to stay in control of their shelter. In contrast, winds up to 24 mph will cause small trees in

leaf sway and will whip up small whitecaps on ponds and lakes.

Do not increase the surface area that wind can work on by carrying or attaching sheets of plywood or other materials to the platform. You don't want create a sail that will catch the wind and decrease machine stability. Manufacturers that build lifts or accessories specifically to carry these types of materials will account for the load's affect on stability, but if carrying capacity is added by anyone other than the manufacturer, it's hard to be sure of its affect on stability.

Look carefully at all of the air space where the platform is likely to work. Check in all directions within the machine's working envelope for building projections or other overhead obstacles and power lines or electrical equipment. Few AWPs are insulated from electrical strikes, and unless a machine is clearly identified as such, operate it as if you and the machine will be the easy path for current to flow to ground if you come too close to voltage.

You don't have to touch wires carrying more than 300 volts to become the path to ground. As voltage increases, the gap that electrical current can arc across grows. The minimum safe approach distance (MSAP) is 45 feet for the highest voltages that you are likely to encounter. If voltage is unknown, the AWPT recommends a simple rule of thumb: Maintain an MSAP for any part of the machine of 50 feet from wires mounted on steel towers and 30 feet from wires on poles. Don't forget to allow room for wires to sway in the wind.

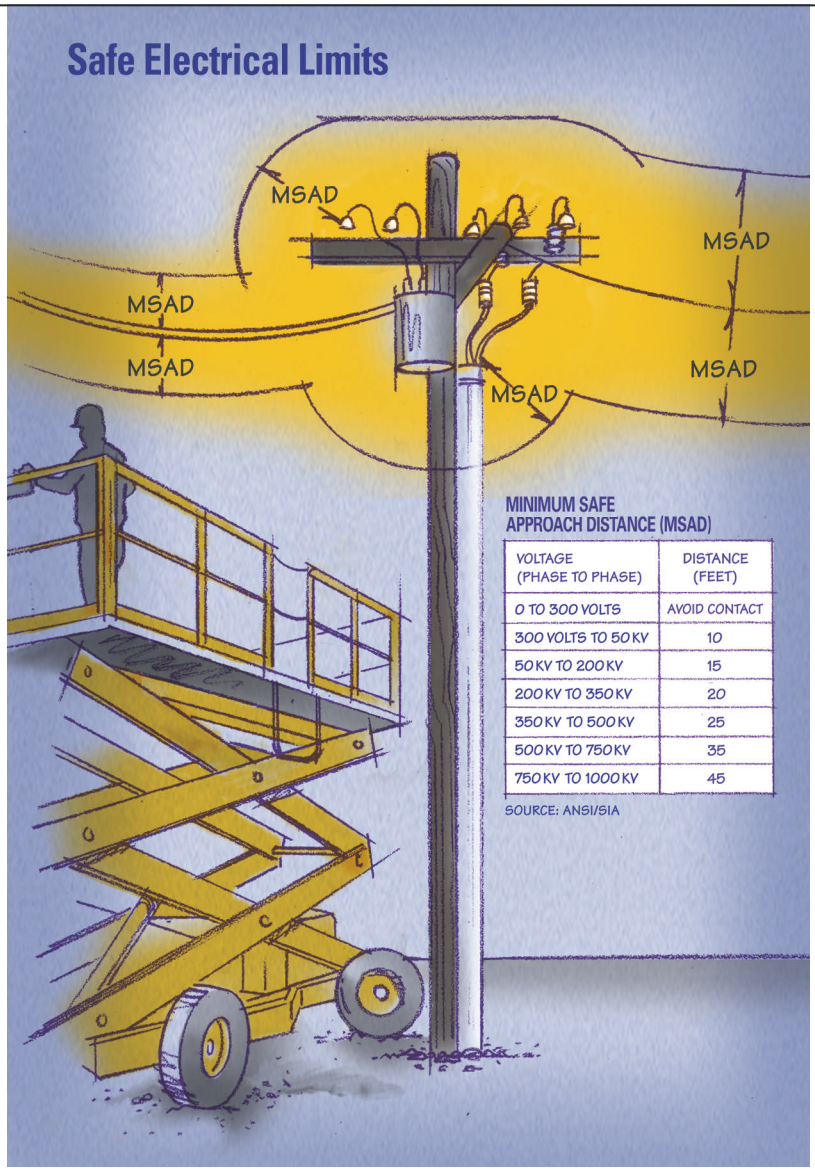
The AWPT recommends using ground-level barriers to mark boundaries where a work platform is safe from entering a dangerous space. Another option is high-level markers that make the wires or the MSAP more visible to lift operators.

Wear a hardhat, or other approved headgear when operating an aerial lift. After all, your head becomes the highest point when operating.

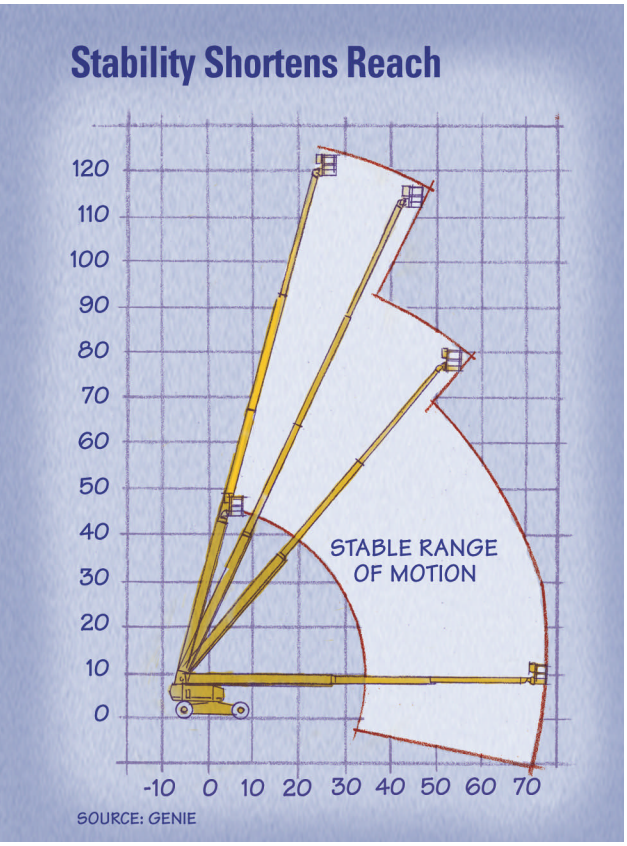
Full-body harness with adjustable lanyard as short as possible is required for boom-lift occupants. People in a boom's platform can be bounced around and even launched over the guardrails if the platform rolls over a sudden change in grade or if obstacles interfere with the boom in motion.

Lanyards should only be attached to the anchor provided by the manufacturer specifically for that purpose, not the guard rails and never to any other object or a structure outside the platform.

Stepping from a lift platform to an adjacent structure is not recommended because of the fall risk inherent in the maneuver but, if it's necessary, you'll need a safety harness and two lanyards. ANSI requires 100-percent tie-off — you must be tied off at all times in situations like this. That means you need two lanyards — one tied off to an anchor in the platform



Because voltage can arc across the air to find an easy path to ground, operators must observe the minimum safe approach distance (MSAD) for protection from accidental discharge. Be sure to allow for sway in power lines and booms.



Lowering a work platform does not necessarily mean that the machine is moving to a more-stable position. This telescopic boom's range-of-motion chart shows that the boom must be retracted, moving the load toward the turntable, in order to maintain stability as the platform nears the ground.
Source: Genie

and the other tied off to a suitable anchor on the structure to which you're transferring. The platform floor should be within one foot of the structure to which you are transferring.

Scissor lifts don't experience the same dynamics as a boom. What scissors give up in reach, they gain in stability, and occupants are unlikely to be tossed off the deck unless they climb or lean over the railings and fall or the machine is toppled. Safety harness and lanyard are not required for scissors operators.

The possibility of confusion raised by tie-off requirements in one type of lift but not another has raised concern among some safety professionals. Work sites where both boom and scissor lifts are available are the cause of most concern. Proponents of tying off in scissor lifts say that if harness and lanyard were required in both types of lifts, operators would be more likely to tie off when using boom lifts. The only safety-equipment change would be the likely need to shorten the lanyard in a boom's smaller platform.

Opponents to tying off in scissor lifts argue that the longer lanyard needed on some scissor platforms can be a tripping hazard. Some suggest that a tied-off operator falling over the side of a scissor lift could create enough side pull on the lift to tip it over onto himself. Another obstacle is that many old scissor lifts, and some new ones, do not have anchorage points built into the platforms. Railings can't be used as anchors.

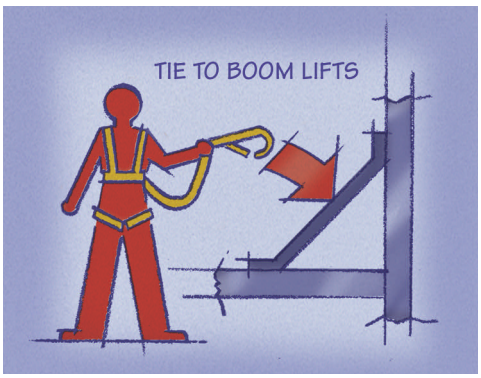
Some scissor-lift manufacturers recommend fall-protection use. But without regulation, it seems the debate over tying off in scissor lifts is only likely to be settled officially in the few circumstances where it is required by job-specific risk assessments, local regulations, or employer guidelines.

Before going up to work, the operator is responsible for thoroughly inspecting the machine (even if another operator has already put the unit into service that day) to be sure it's in good working order and ready to perform. Review the section in the machine's operator's manual on pre-operation inspections for a checklist of things to look for. Always confirm recommended tire-inflation pressures, as it will significantly affect the lift's stability.

Both the ground controls and controls in the platform should be checked for proper function. Never slam a control lever from one position, through neutral, to the opposite position. Always come to neutral, stop, and then proceed in the desired direction. Operate levers with controlled, even pressure.

All of the control levers and switches should return automatically to the neutral position when released, and the platform controls should only operate when the foot switch has been depressed. When extending or retracting the boom, check for delayed movement on the fly section, indicating loose cables.

Push the emergency stop switches while operating the controls to make sure that all



OSHA requires occupants of boom lifts to tie off in a boom lift's platform, but not in scissor lifts. Job-specific risk assessments, local regulations, or employer guidelines may, however, require tying off in scissors platforms. Safety harness and lanyard combinations must be attached only to the anchorage provided by the manufacturer.

functions stop. Operate functions against the machine's cutout switches. Try to raise the platform without outriggers or axles extended and cycle a boom lift to the furthest extent of its operating envelope to test the boom control system, for instance. If these safety limiters don't stop the machine automatically before it moves into an unstable position, shut the machine down and have the systems repaired before going to work.

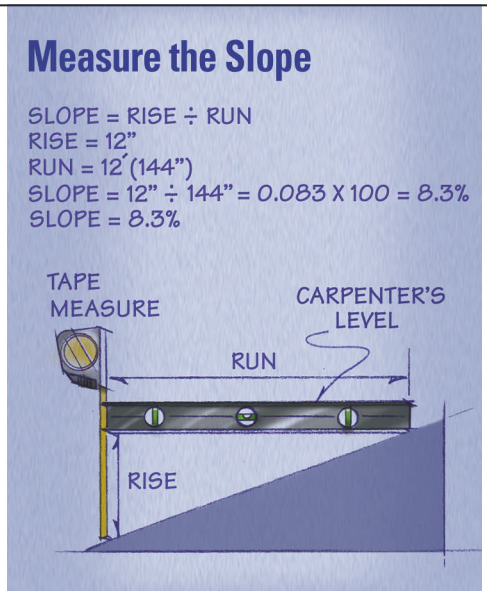
Raise the platform a few feet, find the manual descent system or auxiliary power system, shut the machine down and use the emergency system (according to the operator's manual) to lower the platform.

It's the operator's responsibility to make sure that a worker on the ground is properly trained and has demonstrated the ability to operate the lift from the ground controls. Trained people on the ground will be the operator's best chance of being rescued if something goes wrong while he is aloft. People trained to use ground controls should also know how to use the auxiliary systems for lowering a disabled lift.

Be aware of limited site distance when driving boom lifts from the proper position, with the boom centered between the rear wheels. Before traveling, check to be sure the stabilizers or outriggers are properly stowed; there are no ramps, trenches, holes or other dangerous conditions along the intended path; there are no overhead cables, building projections or other overhead hazards; people on the ground have been warned; nothing has been left unsecured or liable to fall from the work platform; and no hoses, cables, or wires are hanging or trailing from the machine.

Only AWPs that are designed to do so should travel with workers raised in the platform, and only units designed for climbing slopes should be driven on them. When driving a work platform, the AWPT strongly recommends getting a person on the ground to guide you. A small jolt caused by tires running over an uneven surface will be magnified considerably at the platform, even threatening to catapult the occupants or tip the machine.

Before raising a platform, make sure the machine is leveled within manufacturer's limits and located on a firm surface. Don't use a machine's tilt alarm as a level indicator because it will only sound when the machine is on a severe slope. The boom-lift operator is responsible for making sure that the platform or boom is never over the head of a worker on the ground.



To measure a grade, lay a straight edge or board at least 3 feet long on the slope. Lay a carpenter's level on the straight edge and raise the end until it is level. Measure the distance to the ground. Divide that distance (the rise) by the length of the straight edge (the run) and multiply by 100 to get the percent slope. If the slope exceeds the maximum slope rating, then the machine must be winched or transported over the slope.

Extendable axles must be extended, or stabilizers deployed to ensure the stability of lifts so equipped. Know the weight of all the occupants, tools and materials going up in the platform, and make sure the total load is within the machine's maximum safe operating load.

Do not use drive functions to position the platform close to obstacles. Use boom functions instead.

Never use guard rails, ladders, staging or anything else in the platform to extend your reach or height for any purpose. Keep your feet firmly on the deck of the platform at all times.

Don't use platform controls to free a platform that is caught or snagged by a nearby structure or obstacle. Get people out of the platform before attempting to free the platform using the ground controls.

An AWP is not a crane, and it should not be used to lift attached loads unless its manufacturer has designed it to lift the specific load. Workers in a platform should never push off or pull toward any object outside of the platform.

There is much more to know about operating an AWP safely, most of which can be found in each machine's operator's manual.

Training Resources

Aerial Work Platform Training Inc. (AWPT)
717/762-1911
www.awpt.org

International Union of Operating Engineers Local 150
815/436-4150
www.asiplocal150.org

JLG Industries
877/554-5438
www.jlg.com

Genie Industries
425/881-1800
www.genieindustries.com

VISTA Training
800/942-2886
www.vista-start-smart.com

By WALT MOORE, Senior Editor

Better Than Ever At Bustin' Hard Stuff

Today's hydraulic breakers are more technically advanced and easier to service than their predecessors

Considering all the tough jobs that mounted hydraulic breakers can take on, it's no wonder why these powerful tools are so popular. Chores range from demolishing buildings, to removing cracked sidewalks; from trenching in rock, to breaking frozen ground for utility repairs; and from secondary reduction of blasted material in quarries, to selectively uncovering pockets of ore in large mines.

Unofficial estimates place North America's current annual mounted-breaker market between 10,000 and 15,000 units — a market shared by a multitude of brand names. Many of the familiar names, however, are the result of private-labeling agreements in which, for example, an excavator or skid-steer-loader manufacturer places its own brand on products purchased from a breaker manufacturer.

Peter Bigwood, president of Atlas Copco Construction Tools, sees smaller breakers as becoming increasingly private-label commodities. And in North America, he says, smaller breakers also are beginning to supplant handheld tools, but not yet to the extent that this trend has taken hold in Europe and Asia.

Other trends Bigwood observes include the expanded use of quieter breaker models, especially for reclaiming demolition debris on

Illustrative of the technology available for today's hydraulic breakers, the Atlas Copco HB 2500's start-up/shut-down behavior can be tailored to the operating situation; it can adjust the impact-energy/blow-frequency ratio; and it uses an automatic greasing system.

The "unbreakable" tool for Allied's Rammer in-Series is designed to resist binding by virtue of its trapezoidal shape, side-relief contours, and 5-inch-diameter construction.

site; the use of larger models in quarries as the use of explosives becomes more regulated; and, overall, a move toward breaker designs aimed at protecting these tools from on-site hazards, including the inexperienced operator.

Basic design considerations

Mounted hydraulic breakers reflect two basic exterior designs — "side-plate" and "boxed" — the latter sometimes also identified as "enclosed" or "full-cradle." The side-plate design essentially uses two slabs of steel that typically are secured to the sides of the breaker with threaded fasteners, an arrangement that usually leaves the front and back of the breaker open.

According to Al Springer, national sales manager for Allied Construction Products, advantages for side-plate breakers include a simpler, often-less-expensive design, cooler operation and reduced operating weight. On the minus side, says Springer, these breakers are louder (than their boxed counterparts), side bolts can loosen or break, and the plates do not afford as much protection as do boxed designs.

Boxed breakers use an outer housing that completely surrounds the breaker mechanism, which normally is positioned in the housing with blocks of resilient material that buffer the breaker from the housing and create a shock-absorbing barrier at the top, where the breaker mounts to the carrier. Advantages for the boxed design, says Springer, include more protection from jobsite debris, quieter operation, reduction of shock and vibration transmitted to the carrier (thanks to the resilient upper mounting), and no problems with plate-mounting bolts.

Powering the piston

Mounted hydraulic breakers also can be classified by the principal means they use to "fire" (force down) the piston, which strikes the breaker's working tool that actually engages the material to be broken. In today's market, you'll find three basic piston-firing systems: nitrogen-gas only, hydraulic-oil only, and a combination of nitrogen gas and hydraulic oil. All three designs, however, use hydraulic oil from the carrier to raise the piston to its firing position.

As the piston in a nitrogen-fired breaker is forced upward, it compresses the gas charge above it. When hydraulic pressure below the piston is released, the compressed nitrogen forces the piston down. A major advantage of the gas-only breaker, says Chuck Stevens, senior vice president of sales for NPK, is the capacity of the nitrogen charge "to keep up with the velocity of the piston." According to Stevens, the gas-only design is simple, easy to service, and requires little maintenance, other than periodically checking the nitrogen charge.

Oil-fired breakers, on the other hand, rely principally on pressurized hydraulic oil from the carrier to force down the piston. This design, however, typically also employs an en-

Ingersoll Rand's new SC-Series breakers can be fitted with a standard working tool, or with a clamp-on tamper foot or clean-up bucket.

closed nitrogen charge that serves as a shock absorber for the hydraulics, according to Tom Pinchuk, attachments marketing manager for Ingersoll Rand. This "energy chamber," as Ingersoll Rand calls the area containing the nitrogen charge, accepts oil displaced from the top of the piston as it moves upward to its firing position.

When the piston fires, pressurized oil from the carrier forces the piston down. Near the end of its stroke, however, the piston is moving so fast that flow from the carrier may not keep pace. To avoid cavitation, the energy chamber releases additional oil to supplement flow from the carrier. According to Pinchuk, since the "fully hydraulic" breaker does not principally nor directly rely on compressed nitrogen gas to generate blow energy, the breaker strikes with constant maximum force, regardless of nitrogen pressure.

The oil/gas-combination breaker uses both nitrogen and hydraulic oil as principal firing means. Nitrogen in a sealed chamber at the top of the piston is compressed as the piston is lifted. When the compressed nitrogen fires and forces the piston down, the nitrogen's effort is assisted by the carrier's pressurized hydraulic oil, which typically is forced into an annular space around the piston and adds energy to the descending piston. Some combination breakers can derive as much as 75 percent of their piston-firing power from the nitrogen charge.

Allied's Springer brings a sense of perspective to the various designs:

"Manufacturers frequently are asked what breaker design is best," says Springer. "We as manufacturers have our biases, of course, but all three designs have plus and minus points. All three are good, or they wouldn't persist in the marketplace."

Technology enhancements

Among the most potentially damaging events in a breaker's life is "blank firing," that is, when the piston slams down to the bottom of its stroke without contacting the tool, thus forcing the breaker to absorb tremendous energy. To lessen the effect of blank firing, some breaker designs incorporate a hydraulic cushion at the end of the piston's stroke. Other designs prevent the breaker from firing if insufficient resistance (or preload) is sensed at the working surface.

Yet other designs, such as that reflected in the Allied Rammer m-Series and in certain larger Atlas Copco models, allow the breaker, in the hands of an experienced operator, to be adjusted to suit the application. The breaker can be made either to shut off automatically when preload diminishes to an undesirable degree or, conversely, to begin operating with no preload to facilitate working in difficult horizontal or overhead positions.

A number of today's breakers also feature the capability to automatically adjust the ratio of impact energy to impact rate to suit the material being broken. Breakers typically are more efficient in hard materials, for example, when working at maximum blow energy, but at reduced blow frequency. In softer materials, reversing this ratio normally results in the greatest efficiency. The potential benefits of being able to adjust these parameters, says Ingersoll Rand's Pinchuk, include improved production, reduced fuel consumption and less carrier wear.

To complement the piston's percussive force when working in particularly tough material, some larger breakers can recover recoil

Breaker Capacity

Breaker manufacturers typically identify the capacity of their products with an "Impact Energy Class" rating (expressed in "foot pounds") which, to be honest, is usually an arbitrary number based loosely on the weight of the breaker. But, that said, the Mounted Breaker Manufacturers Bureau (MBMB) of the Association of Equipment Manufacturers (AEM) in 2001 developed a test procedure to measure the impact energy of a breaker under controlled conditions. The logic behind creating the test standard was to bring uniformity to breaker-capacity ratings.

For various reasons, the MBMB test standard has not met with universal acceptance in the breaker-manufacturing community. Although it's probably safe to say that major breaker manufacturers invested in the needed test equipment, and likely still do test new models with the MBMB procedure, most do not publish these numbers. We hasten to add, however, that some do, if not for the entire product line, then at least for certain models. But these numbers usually are accompanied with the traditional Impact Energy Class rating.

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energy by using it to force hydraulic oil into an accumulator, which then adds the force of this oil to the next blow. Some manufacturers claim energy boosts of up to 25 percent.

Jobsite conditions that can quickly shorten breaker life are insufficient lubrication of the working tool and abrasive dust that works its way into the lower portion of the breaker. Thus, more breaker models are being fitted with automatic lubrication systems. And for breakers at work in extremely dusty and abrasive applications, a sealing system (usually an option) often can be installed at the tool/housing interface to prevent intrusion of damaging debris.

Also high on the list of technical advances is easier maintenance and overhaul. Increasingly, more breakers are being designed to allow easier changes of the lower bushing and working-tool — sometimes even in the field and without removing the breaker from the carrier. And in a growing number of instances, easier routine maintenance is complemented by new designs that require far less time to overhaul, compared to predecessor models.

And in all of this, as Tom Pinchuk reminds us, advances in metallurgy also have greatly enhanced the overall performance and durability of the mounted hydraulic breaker. CE

Web Resources

Find hydraulic-breaker manufacturers' websites in the online version of this story at ConstructionEquipment.com. Just click on Archives, Buying File, and you'll find a link to this story.

Breaker Specifications (Ranges for Impact Energy Class and Working Weight)

	# Models	Impact Energy Class (ft. lb.)	Working Weight (lb.)
Allied			
S-Series	12	200-1,600	290-1,730
E-Series	6	2,000-3,500	2,300-3,770
G-Series	8	5,500-16,000	5,180-15,500
in-Series	4	200-500	152-453
m-Series	2	4,000-7,000	3,042-4,145
AR-Series	8	500-7,500	508-5,970
Arrowhead			
S-Range	5	250-1,250	220-1,078
Urban-Range	3	2,000-8,000	2,178-7,392
Atlas Copco			
SB-Series	12	100-1,200	77-939
PB-Series	6	200-1,200	200-1,210
MB-Series	5	1,300-4,000	1,210-3,750
HB-Series	6	5,000-15,000	4,850-15,400
Bobcat			
B-Series	1	875	935
HB-Series	4	150-750	494-819
BTI			
TB-ME	5	350-1,100	240-750
TB-QA	5	750-2,000	495-1,850
TB-X	6	850-3,000	735-2,490
TB-XC	9	1,100-13,500	1,295-10,195
BT-Series	10	650-10,000	463-8,159
Caterpillar			
D-Series	6	150-11,000	103-8,379

	# Models	Impact Energy Class (ft. lb.)	Working Weight (lb.)
Huskie			
HH-Series	12	150-8,000	165-6,610
Indeco			
HP-Series	19	200-16,000	230-17,200
Ingersoll Rand			
Light	8	225-1,200	176-840
Medium	3	1,500-3,000	1,290-2,450
Heavy	8	5,000-15,000	3,460-12,470
Kent			
KF-Small	5	150-750	203-844
KF-Medium	3	1,000-2,000	958-2,542
KF-Large	6	3,000-10,000	3,090-10,274
MKB			
M-Series	5	150-750	121-551
N-Series	3	1,200-3,000	882-2,712
V-Series	7	4,000-18,000	3,351-13,007
NPK			
E-Series	9	150-3,000	235-3,450
GH-Series	5	4,000-15,000	4,200-13,500
Okada America			
Small	8	150-1,250	176-1,008
Medium	7	2,000-7,500	1,466-6,448
Large	2	10,000-15,000	8,157-11,905
Stanley			
Series-6	6	175-1,200	173-1,050
EXS-Series	9	1,200-12,000	1,100-8,799

Source: www.Spec-Check.com

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Gallery of Hydraulic Breakers

ALLIED CONSTRUCTION PRODUCTS

Broad Selection

Allied Construction Products has two breaker lines, Rammer and the AR-Series. The Rammer line includes five different breaker series, a total of 32 distinct models, sized to fit a broad range of carriers. The AR-Series, says Allied, meets the growing demands of the rental market and offers "an alternative hydraulic breaker" to contractors.

Number of models: 40

New models: in8, in11, in15, in22, m14, m18, G 88 and AR 70C

Product-line features: The Rammer m-Series breakers (the m-18 is pictured) are designed as three modules, which can be separately (and speedily, says Allied) repaired. According to the company, the m-Series features adjustable impact energy, constant blow energy, high power-to-weight ratios, heavy pistons for high impact energy, no tie rods or bolts and the RamData blow counter that signals (via colored lights) when specific maintenance is required.

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STANLEY

Protected Side-Plate Hardware

According to Stanley, the three smallest models in its Series-6 line (MB 156, MB 256 and MB 356) feature a stress and fatigue-resistant body design with fully protected side-plate hardware that "virtually eliminates bolt failures." The three largest models (MB 556, MB 656 and MB 956) use a fully enclosed housing that employs an "anti-vibration design with the power cell floated between upper and lower bumpers."

Number of models: 15

New models: MB 15EXS

Product-line features: The Stanley line of MB EXS Stealth-Series breakers are designed to fit hydraulic excavators weighing from 10,000 to 130,000 pounds, and the three smallest models (MB 15EXS, MB 20 EXS and MB 30 EXS) are suitable for use on backhoes weighing from 10,000 to 28,000 pounds. These breakers incorporate noise-suppression features and have an "armored" (heavy-duty) lower end for the enclosed housing.

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INGERSOLL RAND

Fully Hydraulic Operation

The Ingersoll Rand range of mounted hydraulic breakers (which includes three series: (Tramac Heavy; Tramac Medium; and the SC/CB models) features fully hydraulic operation. An integral design feature is an "energy cell," which supplements hydraulic flow from the carrier and, says the company, ensures maximum energy with every blow.

Number of models: 19

Product-line features: An automatic pressure regulator in Ingersoll Rand breaker models is designed to maintain proper operating pressure at any flow rate within a specified range. Heavy- and medium-class models also feature an energy-recovery valve that "recycles recoil energy and adds it to the next blow" and a trapezoidal piston designed to generate "a progressive, sustained shockwave that builds intensity throughout its duration."

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OKADA AMERICA

Long-Stroke/High-Velocity Piston

According to Okada America, the design of its breakers features pistons that have a long stroke and attain high velocity for maximum impact energy. These breakers employ a combination of high-pressure hydraulic oil from the carrier as well as a compressed-nitrogen-gas charge to fire the piston.

Number of models: 17

Product-line features: Okada America makes the point that its unique heat-treating process produces special-strength working steels that provide long-wear life in severe applications. Large upper and lower tool bushings are designed with special, wear-resistant alloys.

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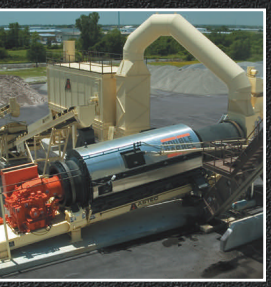

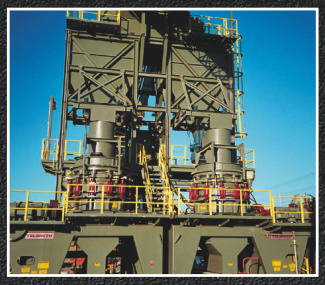

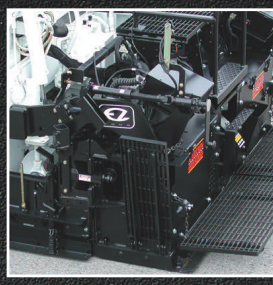

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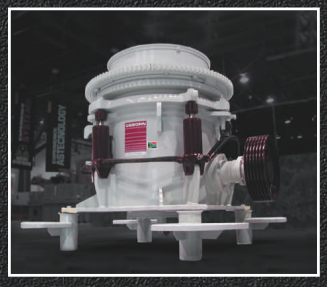

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Gallery of Hydraulic Breakers

HUSKIE

Two Moving Parts

The piston and the main valve are the only moving parts on its breakers, says Huskie, and all of its models are serviceable in the field without special tools. According to Huskie, its breaker models feature a "gas-assist" cycle, using the hydraulic system to provide most of the firing power.

Number of models: 12

New models: HH150-2, HH300-2, HH500-2, HH750-2, HH1000-2

Product-line features: Newest in the Huskie line are the Series-2 models which, says the company, provide as much as 50 percent more power in the same package as predecessor models. The Series-2 features redesigned pistons, main valves and internal porting. Larger models in the Huskie line (HH2000-HH8000) provide two levels of blow energy and frequency.

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KENT

Dust-Intake Protection

The largest of Kent's F-Series mounted hydraulic breakers (KF19Qt through the KF70Qt) feature a dust-intake-prevention system designed to minimize dust intrusion into the front head during the piston upstroke. According to Kent, this feature extends the life of the piston as well as the working steel and bushings.

Number of models: 14

Product-line features: Features of the model KF22Qt (pictured) include a built-in safety valve that actuates when the carrier exceeds the unit's maximum pressure, a greasing system that lubricates the front head and front bushings, plus higher backhead pressure and larger piston diameter to increase impact energy by as much as 20 percent compared with predecessor models.

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ATLAS COPCO

Automatic Power Boost

The largest models in Atlas Copco's four-series breaker line are in the HB (Heavy Breaker) range. Powered by a combination of hydraulic oil and nitrogen gas, these models receive as much as 75 percent of their piston-firing power from the nitrogen. In tough conditions, HB breakers can switch to an energy-recovery mode, boosting percussive output by as much as 25 percent.

Number of models: 29

New models: SB 100, SB 150, PB 530, MB 700, HB 2500

Product-line features: Atlas Copco's SB (Solid Body)-Series includes 12 models that range in weight from around 75 to 950 pounds and feature a one-piece design that contains all integral components in an iron-alloy casting. Newest additions to the SB line are the SB100 and the SB150 (pictured), which use a replaceable floating bushing and incorporate a built-in relief valve to protect against excessive pressure from the carrier.

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ARROWHEAD

"Urban Silencing"

The Arrowhead range includes two breaker series, the S-Series and the Urban-Series. The latter features reduced-sound operation, mechanical/hydraulic recoil dampening and, says the company, a tolerance for a wide spread of pressure and flow.

Number of models: 8

Product-line features: The S-Series range includes five models that range in Impact Energy Class ratings from 250 to 1,250 foot pounds. The largest model, S100, is capable of blow frequencies from 550 to 1,100 and is designed for carriers weighing from 16,000 to 24,200 pounds.

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Gallery of Hydraulic Breakers

NPK

Resilient Mounting Dampens Forces

According to NPK, all of its breakers are built with only two moving parts, are designed to eliminate bladder-type accumulators, use a quick-change tool system and feature separate ports to accommodate an Auto Lube system and an air line for underwater operation. The company's medium and large models use a shock-absorbing mounting bracket with heavy-duty rubber pads to absorb shock, recoil and vibration forces.

Number of models: 14

New models: GH-30

Product-line features: The new GH-Series breakers, says NPK, are benefactors of a computer-modeling design that results in units of lighter weight, yet capable of high impact energy. GH-Series features designed to increase service life and to facilitate servicing include an internal drain system to promote longer seal life, new bottom tie-rod nuts and a new bottom enclosure that affords enhanced protection.

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MKB

Wide Range of Capability

The MKB range of breakers is manufactured by the Konan Construction Group in Japan and distributed (through a network of 300 dealers) by Dominion Equipment Parts. The MKB line provides models ranging in impact-energy-class ratings from 150 to 18,000 foot pounds.

Number of models: 15

New models: 1400N, 1700V

Product-line features: The MKB range of breakers uses a combination of pressurized oil from the carrier and a nitrogen-gas charge to fire the piston. According to the manufacturer, the breakers are designed with noise- and vibration-absorption features.

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INDECO

Automatic Power/Speed Adjustment

Indeco loosely classifies its 19-model HP-Series breaker range into three categories: skid-steer/mini-excavator; tractor-loader-backhoe; and hydraulic excavator. The associated carrier weights for these classifications are, respectively, 0.5 to 6 tons; 4.5 to 12 tons and 7 to 90 tons.

Number of models: 19

New models: HP Series

Product-line features: According to Indeco, its new HP (High Performance) range of breakers features "automatic variance of speed and power," dual shock-absorber systems, two tool retainers, field-replaceable lower insert bushing and power greasing system.

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BTI

Side-Plate and Box-Housing Models

The 35-model BTI hydraulic breaker line ranges in impact-energy-class ratings from 350 to 10,000 foot-pounds, and in operating weight from 240 to 10,195 pounds. The BTI product range includes a mix of side-plate models (TB-ME, TB-QA and TB-X) and boxed-housing models (TB-XC and BT-Series) that accommodate a wide spread of carriers, including pedestals.

Number of models: 35

Product-line features: The BTI BT-Series features 10 suspended-boxed-housing models that incorporate rock claws and abrasion-resistant plating around the nose. A pressure-balancing system on smaller models eliminates the accumulator, but an accumulator used on models rated at 4,000 foot-pounds or more assists in piston acceleration. The eight largest models have remote air porting for underwater operation.

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RC-100

RCV - Vertical Lift

RC-85

SR-70

RC-60 & Turf Edition

RC-50 & Turf Edition

RC-30 & Turf Edition

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Gallery of Breakers

BOBCAT

Switch Between Loader and Excavator

Bobcat, a business of Ingersoll Rand, is the benefactor of its parent company's hydraulic-breaker technology. We have chosen to include Bobcat among breaker manufacturers, however, because Bobcat engineers were instrumental in the development of the small breaker line, and because certain components of the breakers are manufactured in Bobcat facilities.

Number of models: 5

New models: HB1180

Product-line features: Bobcat makes the point that its breakers can be switched between a Bobcat skid-steer loader and a Bobcat hydraulic excavator by using the Loader X-Change frame and an Excavator X-Change mounting cap. The newest of the Bobcat breakers, the 750-foot-pound-rated HB1180, is designed to fit a range of Bobcat models.

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CATERPILLAR

Enhanced Operating Cycle

Caterpillar's new D-Series hydraulic-breaker range to date (more models are coming) covers a broad spectrum of breaker applications, from the model H35Ds to the H160Ds. According to Caterpillar's Work Tool Group, the company designs it own breakers, and then manufactures them via a joint-venture agreement with a major breaker manufacturer.

Number of models: 6

New models: H35Ds, H45Ds, H55Ds, H65Ds, H140D and H160Ds

Product-line features: Larger models incorporate an automatic shut-off feature (blank-firing protection), provide screw adjustment of the pressure control valve (no need to remove the valve), and also feature an enhanced operating cycle that delivers increased power and higher blow frequency than predecessor models. Smaller-model features include an enclosed housing and one-piece body (no tie rods or nuts).

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By WALT MOORE, Senior Editor

Auxiliary Tracks

SOLIDEAL

According to Solideal, its OTT-Track Master system installs over the tires of a skid-steer in less than 15 minutes. The natural-rubber tracks, which incorporate steel cord and spring-steel reinforcements, have a fully closed flotation surface and are designed to be self-cleaning and abrasion-resistant. Tracks are closed with a double-hinged link available in three widths to accommodate the job.

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McLAREN

McLaren Industries' product range includes both replacement rubber tracks and over-tire tracks. Next Generation Series rubber tracks are available for more than 2,400 makes/models of construction and agricultural equipment, says the company, and offered in three track styles designed for friction, positive and gear-driven. The PROTRAC Series of over-tire tracks for skid-steer loaders are available in three styles (Diamond, Magnum and Rubber) that feature pins and links made of heat-treated forged chromium.

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ATI

The ATI Track Module is designed to interface with many types of off-road vehicles and is equipped with an adapter assembly specifically engineered to mate with the existing machine's drive assembly. Changing from wheels to tracks requires about 1.5 hours per module, says ATI. Each module has a load capacity of 25,000 pounds, weighs 6,000 pounds, and provides a footprint approximately 75 inches long and 36 inches wide. Benefits of the module, says ATI, include increased traction and flotation, increased drive efficiency and a smoother ride.

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LOEGERING

The Loegering product line includes several types of over-tire tracks (both steel and "soft-bottom") for skid-steer loaders and aerial-work platforms. Also in the Loegering product line is the Versatile Track System (VTS), which is a rubber-track undercarriage system that can be bolted on in place of a skid-steer loader's wheels. The VTS, which is equipped with suspension, can be installed (or removed) in about an hour, according to the company .

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GROUSER PRODUCTS

Grouser Products offers three types of over-tire tracks for skid-steer loaders: Bar Tracks, Hard Tracks and Soft Tracks. The Bar type is designed to reduce ground pressure as much as 50 percent, says the company, and features a "run-loose" design and 1.25-inch replaceable bushings. The Hard type features replaceable metal shoes and is said to be installed in less than 30 minutes or removed in 10 minutes. The metal shoes are interchangeable with non-marking pads from the company's Soft Track design.

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BLS ENTERPISES

The new BLS Poly Bolt-On track pad is a two-piece assembly consisting of a conventional, triple-grouser, steel track shoe and a bolt-on polyurethane pad. The basic advantage of the design, says BLS, is that the pads can be replaced without disturbing the grouser. Pad mounting bolts are positioned to the outside of the grouser to reduce the prospect of torch heat (when burning off the mounting nuts) from harming lubricated chains. Other benefits, says BLS, include less replacement labor (since the metal grousers stay in place), lower replacement costs (since only the pad need be replaced), and reduced shipping costs.

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MATTRACKS

According to Mattracks, its rubber-track conversion system for 4x4 vehicles can be installed in as little as 30 minutes. The conversion tracks are available in more than 30 models to fit vehicles up to 1.5 tons. The system also is available for front-wheel-assist tractors, for nondriven trailer wheels and for all-terrain vehicles. The new 105- and 150-Series models feature cast-aluminum frames and have gross vehicle weight ratings of 10,500 and 12,500 pounds, respectively.

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SKIDTRAXX

Steeltraxx and Mastertraxx are the two over-tire products from Skidtraxx. Each self-contained section of the Steeltraxx track links to the next via special heat-treated bushings and self-locking hardware. The inner section of each track section has three traction bars to prevent wheel slippage. The Mastertraxx product is a rubber tread (reinforced with an inner wire core) that fits over the tires of a skid-steer loader and features side retainers to keep the track in place and alternating inner traction bars to prevent tire slippage.

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Toolbox Tips

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October 2006

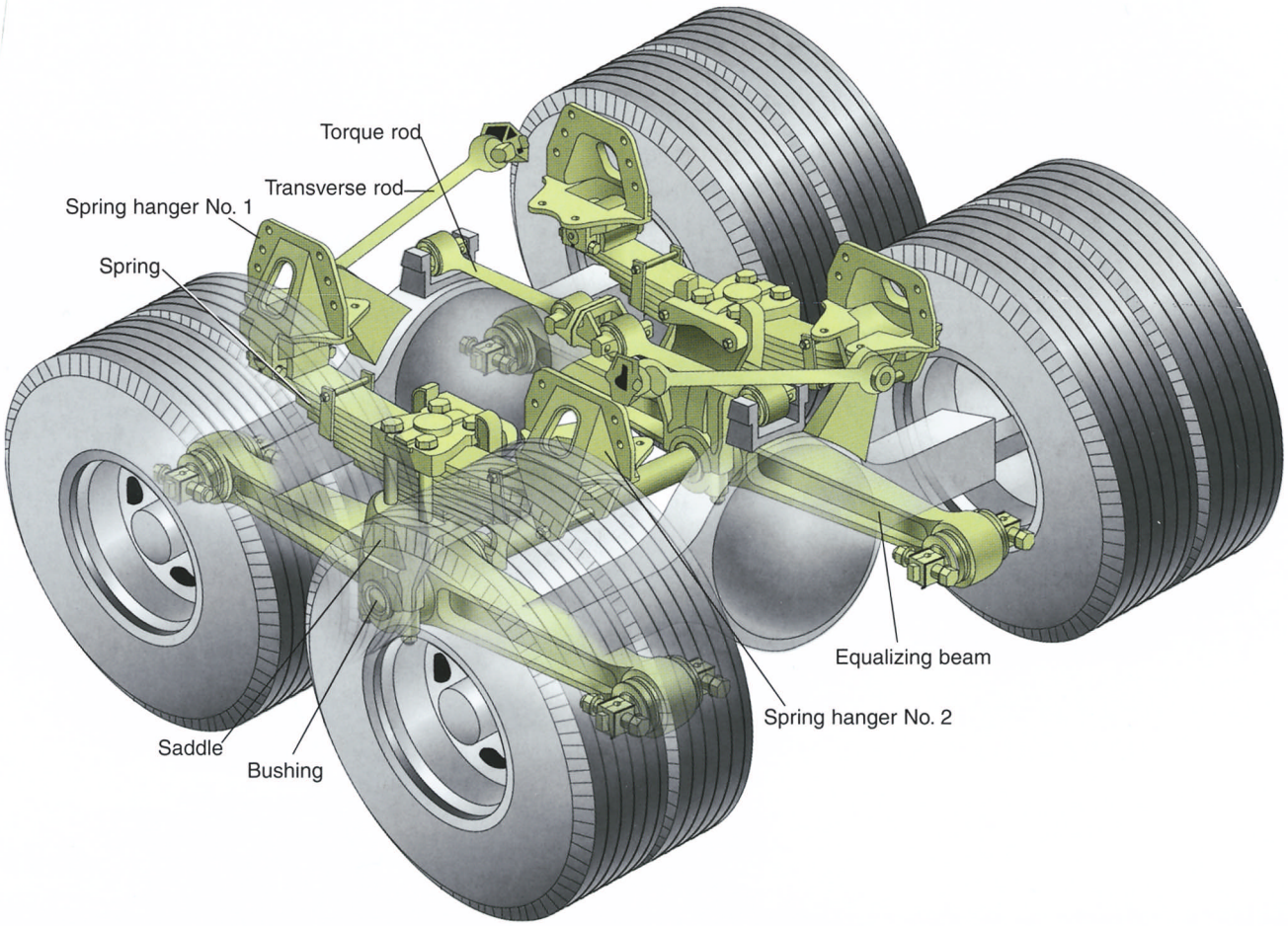
No. 23 in a Series

Grease Keeps Trucks Riding Smoothly

Grease Is Critical

Many vocational suspensions have a main bushing around which their springs or walking beam pivots. This can be a critical lubrication point, along with the spring-eye pin where the spring attaches to the hangers. Jack up the chassis to unload the bushings and pins so lubricant can fill the joint. Pump grease into the zerk until the lubricant flows from both ends of the bushing. Grease regularly (daily is not too often) to keep the pins in shape and the lube flowing through the channels.

(Illustration courtesy of Hendrickson)



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Toolbox Tips

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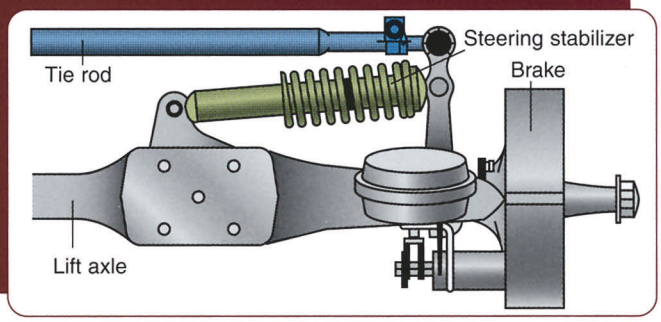
Lift-Axle Steering Stabilizer

In addition to keeping the kingpin and tie-rod ends greased, maintaining lift axles includes watching the steering stabilizer for wear. Inspect them regularly for wear, and watch for wobble as the auxiliary wheels carry a load down the road. On non-steerable lift axles, scuffing or unevenly worn tires suggest an alignment problem.
(Illustration courtesy of Hendrickson)



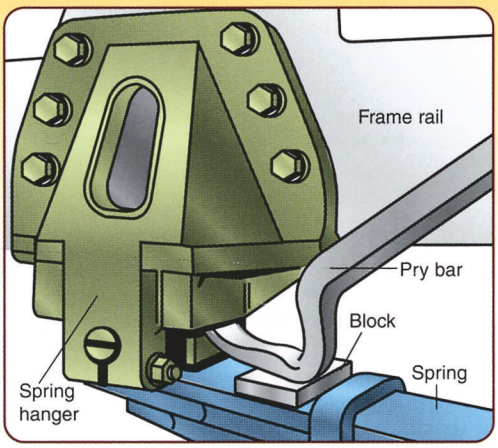
QUICK TIP

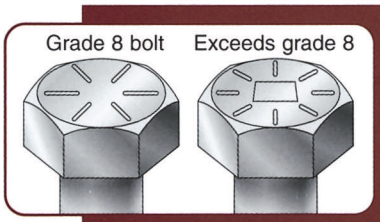
No Heat

Keep cutting torches away from fasteners, springs, beams and bushings (center or ends). Many of the components in a truck suspension are heat-treated for strength and service life. Using a cutting torch will reduce their strength, and a failure could result in loss of control over the vehicle.

Spring Eye Wear

To check for spring eye bushing wear, place a block of wood on the top spring and use a pry bar to lift on the spring hanger. Or, with an empty chassis and brakes applied, attempt to rock the chassis back and forth. If the pin in the spring eye moves 1/8 inch or more, the bushing and pin should be replaced.
(Illustration courtesy of Hendrickson)



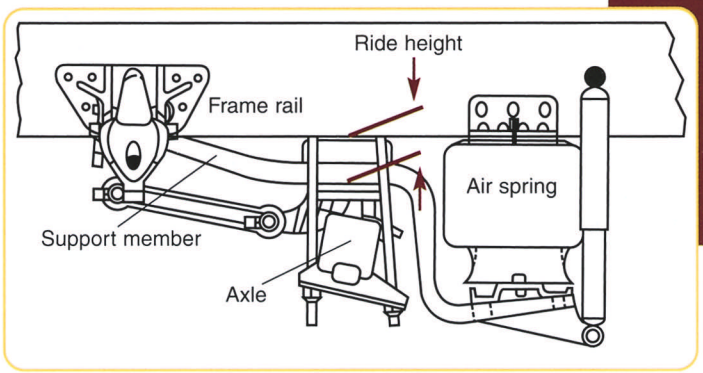


Proper Fasteners

Grade-8 bolts and grade-C lock nuts should be used on torque rods. The heads of metric equivalents are stamped simply with the numbers 10.9 or 12.9. Proper fastener choices not only influence the life of the components, but also assure the equipment is safe.

One Best Height

Adjusting the ride height of an air suspension system to any level other than that recommended by the manufacturer changes the operating angles in the U-joints and is very likely to cause drive-line vibrations that will affect the durability of the joints and other drive line components. Measure ride height from the bottom of the frame rail to the bottom of the main support member.
(Illustration courtesy of Mack Trucks)



By G. C. SKIPPER, Contributing Editor

Technology "Muzzles" Fuel Costs

S.W. Rodgers cuts fueling time and increases accuracy of fueling data

It started with a magazine article, says Richard Byrd, vice president of the equipment division of S.W. Rodgers Construction Co., and ended a year later with a decision to use a high-tech approach to reach an old-fashioned bookkeeping goal — increasing the bottom line.

In order to do that, Byrd knew that he had to boost productivity and, at the same time, put a muzzle on fuel costs that were taking larger and larger bites out of his budget.

Up until this time, productivity had been negatively affected because drivers had to spend time manually tracking fuel costs by using "paper tickets." Drivers inserted the tickets into a meter on the truck and started pumping fuel. When they finished, they had to take the ticket out and write down such information as the equipment number and how many hours the unit had on it. It was a "cumbersome process, Byrd says, so productivity suffered since drivers were filling out tickets rather than "moving iron."

He came across the article about a company called OEM Controls (now known as OEM Data Delivery) that delved into how its various systems were used to improve the management of fleets. "I did some homework over a period of time," Byrd says, "and about a year after I read the piece decided to try their technology."

OEM Controls had just introduced a new generation of products when Byrd made the decision to install their Service Tracker and Pump Tracker products.

"Basically, it's a box that you synchronize

Photos: Christopher Walle©

Fueler Doug Caldwell scans a machine before fueling. Data such as model number and hours are collected. The system then indicates how much fuel the machine is supposed to receive.

PROFILE

Richard Byrd
VP, Equipment Division

S.W. Rodgers Construction

Headquarters:
Gainesville, Va.

Specialty:
Total site development company

Equipment Value:
$60 million

Fleet Makeup:
Graders, dozers, scrapers, loaders, backhoes, excavators

Support Staff:
One shop foreman, two field maintenance supervisors, PM foreman

Market Range:
Within 100-mile radius of Gainesville

Upon completion of the refueling, the fueler scans the Pump Tracker module, which confirms how much fuel was put into the machine. This data becomes part of the record for each individual machine, helping S.W. Rodgers build its maintenance history.

and install on the machine itself. It tells you which machine it is, how many hours the machine currently has on it, and gives you its service intervals."

The Pump Tracker is installed on all the company's fuel trucks. "Drivers use a hand-held device that is a data collector to scan the equipment," he says. "It meters the fuel and records how many gallons are pumped at that particular time. The operator beams the equipment he is about to fuel, and the system allocates fuel to that particular piece of equipment. When fueling is finished, the operator then beams the fuel truck to complete the transaction. The system confirms the gallons dispensed into that machine. When pumping is finished, the operator uses the hand-held device to download the data from both the Service Tracker and Pump Tracker using a simple point-and-click method to document the transaction."

Not only does the Service Tracker keep tabs on how many gallons of fuel are pumped into what equipment, it also builds a repair history by tracking mechanic activity, says Byrd. This allows him to know what repairs are most common, and the average amount of time required for common maintenance tasks such as oil or belt changes. It also produces "big-picture" information, such as which equipment produces the best return on investment and which equipment has the best profit/loss performance.

When Byrd has to rent equipment, the Service Tracker lets him document when the equipment is being used. When the company finishes with the rental equipment, the system even documents if the rental house, after being notified, is late picking up the equipment. "That prevents a potential disagreement," Byrd says.

Measuring the increase in productivity, Byrd says, "is a tough scenario to put savings on, but the drivers are able to fuel more equipment in less time. That's probably where the productivity comes into play, more so than out in the field."

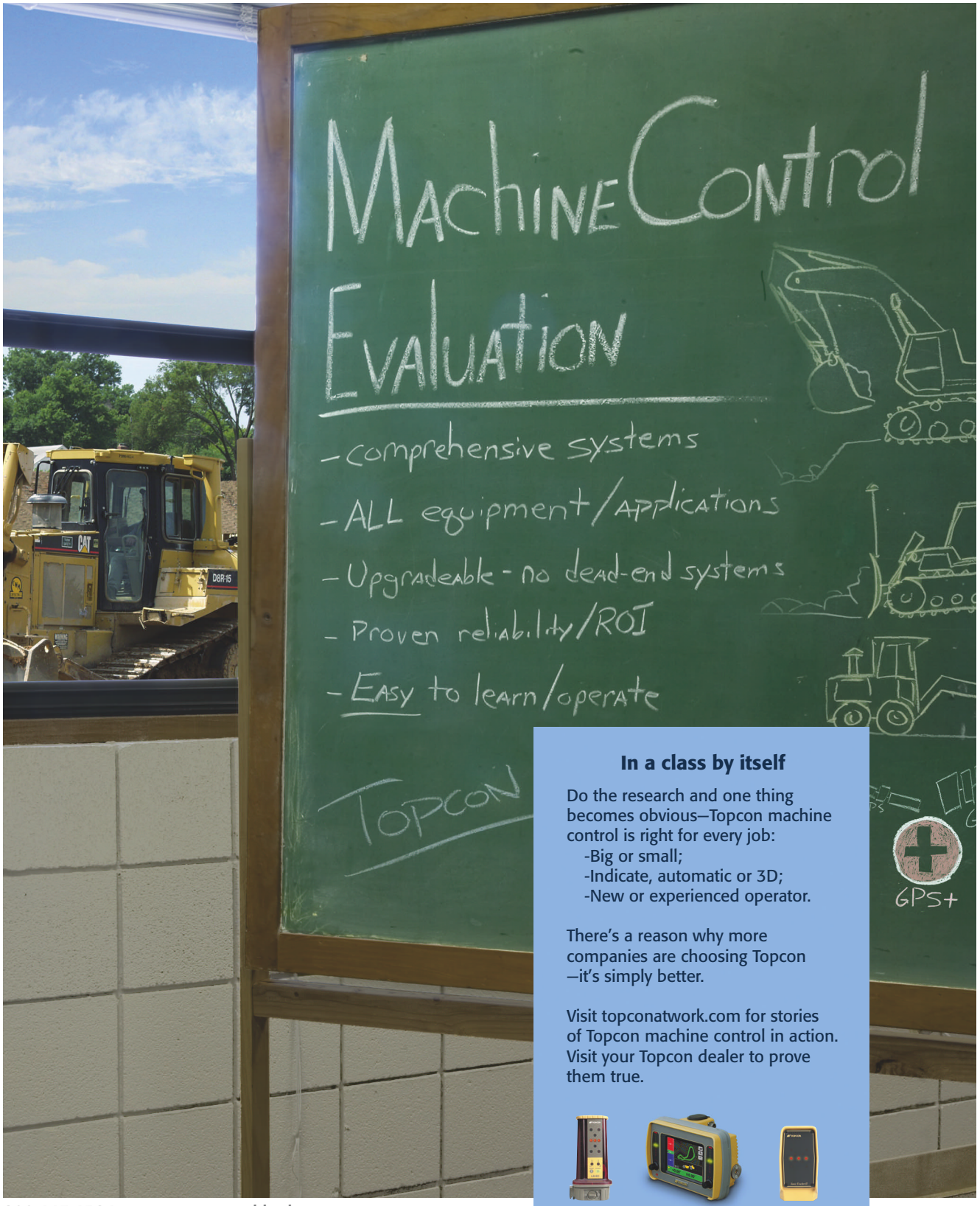
In addition to obtaining more accurate data, there were safety benefits, Byrd says. "We saw it as a way to free drivers from the task of climbing on machines to get hour-meter readings, often while it was still dark outside, and sometimes when machines were locked and unavailable."

Not only has the technology improved productivity and data accuracy, but by doing so it has also helped Byrd bid jobs more efficiently, he says. In fact, the next thing Byrd is considering is adding more capability to the system that will allow him to also track crew and subcontractors.

S.W. Rodgers has 300 to 350 units with the tracking system. The initial installation was done by OEM Controls, says Byrd, but Rodgers did the rest. "Putting them on the machines takes about an hour per machine, but that's really all the maintenance you have."

Data goes into a DataVault and is reported each night via the Internet. It also makes the information available in a form that is "immediately useful to managers," says Byrd.

The system also saves about 15 minutes per shift, according to Byrd, and since reports are generated each night, the payoff to the company is well worth the investment, he adds.



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NEW HOLLAND

By MIKE VORSTER, Contributing Editor

How to Manage Fixed-Cost Budgets

Accuracy in recovering costs requires more than simple division. Managers must understand the nuances of fleet utilization.

Prepare the budget, record actual costs, calculate the variance, take appropriate action. It is a standard business ritual that we do on a regular basis. Most likely we prepare and develop the budget once a year, compare budget with actual, calculate variances, and take action on a monthly basis. But doing it regularly does not mean that we do it well or that we fully understand the complexities involved.

Let's look at four things we can do to improve the effectiveness of the budget-management process.

Generate the monthly budget. Let us assume that the depreciation charges for a group of 10 loaders in our fleet comes to $600,000 for the year ahead and that we wish to compare the actual monthly charges with the budget on a monthly basis. It appears to be simple and straightforward. We divide the expected $600,000 charge by 12, assign $50,000 as a budget for each month, and track the actual charges against the budget.

"Insisting that each sub-fleet operates within its budget is the first step in knowing your costs and in ensuring that one portion of the fleet does not subsidize another."

The process of assigning budget on a monthly basis works well to check monthly charges but, unfortunately, it gives us no insight into the performance of the group. The depreciation budget would be on target regardless of whether the loaders worked 50, 100 or 200 hours in a month.

Suppose now that we base our budget on the expectation that the loaders will work 2,000 hours per year. Each machine must recover $30 per hour in depreciation if the group is to recover $600,000 in annual depreciation charges. Under these conditions, the machines "earn" their depreciation budget by working and will only be on target if actual charges were in line and if the machines achieved the expected monthly utilization.

Budgeting on an assigned monthly amount for a fixed cost such as depreciation causes you to lose sight of the impact that utilization has on fixed-cost recovery. This is extremely dangerous. It is much better to base fixed-cost budgets on an hourly rate and cause machines to earn their budget by working at or above their expected utilization. You achieve two things. You can check whether actual charges match budgeted charges and, much more importantly, you can check whether you are achieving the utilizations needed to recover fixed costs at the expected hourly rate.

Analyze the cause of the variance. There are two kinds of budget variance. A quantity variance is due to an increase or decrease in the quantity of the resource used, and a cost variance is due to an increase or decrease in the cost of the resource.

Let's look at an example of a $210,000 fuel budget based on an estimated consumption of 120,000 gallons at $1.75 per gallon. Suppose that the actual consumption was 130,000 gallons at an average cost of $2.20 per gallon. This gives a total cost of $286,000 and a budget variance of $76,000. Before you can take action, however, you must split the $76,000 variance into its two components: a quantity variance of $17,500 (10,000 gallons at $1.75 per gallon) and a cost variance of $58,500 ($0.45 per gallon for 130,000 gallons).

Mike Vorster

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

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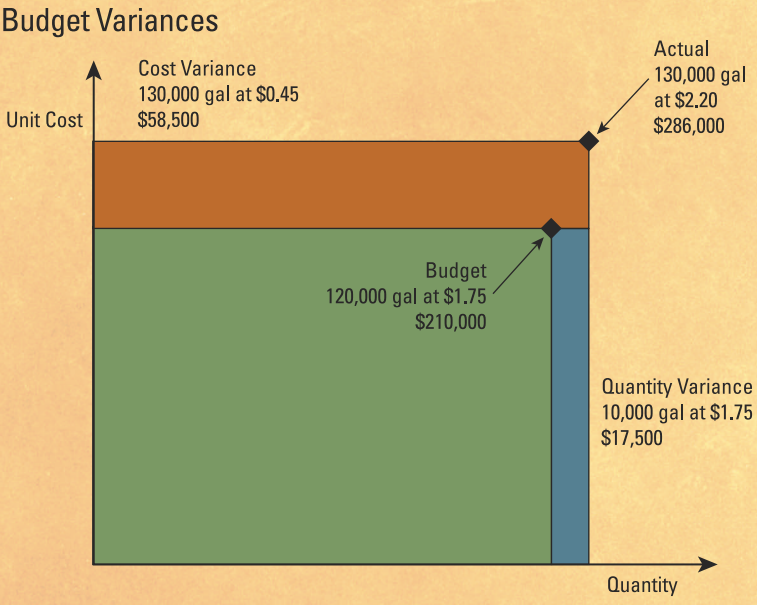
You are approximately 8 percent (10,000 gallons in 120,000 gallons) light in your quantity estimate, and you need to take certain steps to fix that. The main problem, however, is an underestimate of 26 percent ($.45 in $1.75) in the cost per gallon. The action needed here is different from the action you take to solve the quantity variance.

Manage by groups and categories. If someone shouts "fire," you have to know which exit to take. Setting up budgets and comparing actual cost with budgeted cost is similar: The variance indicates that there is a problem, but you will have to know where the problem lies and what action to take. It is not sufficient to know that "the equipment account is over budget by $250,000." You have to know what portion of the fleet is not meeting budget, and you have to know which cost category is causing the problem. Two things are important:



This budget overrun of $76,000 must be split into a quantity variance of $17,500 and a cost variance of $58,500.

• Establish clear sub-fleets and produce concise actionable cost data for each. The light transport fleet is different from the on-highway hauling fleet, and this in turn is different from the grading fleet. Establishing clearly defined fleets and insisting that each operates within its budget is the first step in knowing your costs and in ensuring that one portion of the fleet does not subsidize another. Further subdivision by class or category is necessary if we want to know what it costs to own and operate a certain class of machine and if we want to stop the new excavator fleet from paying for the old dozer fleet.

• Manage costs by category. You cannot take appropriate action if you do not know which cost category is causing the problem. Owning costs are seldom subject to cost variances as most of the cost components are known when the deal is inked. They are, however, prone to quantity variances as utilization affects the number of hours needed to recover fixed annual costs. The opposite is true for operating costs where changes in the cost of resources such as labor, parts and supplies affect the picture tremendously. A large, volatile cost category such as fuel must be identified and managed separately so that you can focus on the impact of price changes and not lose sight of improvements you may be making in other areas.

Focus on cost recovery. When you set up your budget, you are making an estimate of the actual cost of owning and operating your fleet for the year ahead. Your hourly, daily or weekly cost-recovery rate system should be designed to recover your estimated costs if expectations are met and if planned utilizations are achieved.

It is easier to understand what is going on if the traditional Budget, Actual, Variance columns are replaced with Actual Cost, Recovered Cost, and Over or Under Recovery. This focuses attention on the fact that your rate is nothing more than a routine, systematic and uniform way of providing for or recovering the large, periodic, and often unpredictable expenditures associated with owning and operating an equipment fleet. It also focuses attention on the fact that expenditures — and particularly the fixed costs of ownership — can only be recovered by putting the fleet to work, achieving desired utilizations, and completing construction on time and on budget. CE

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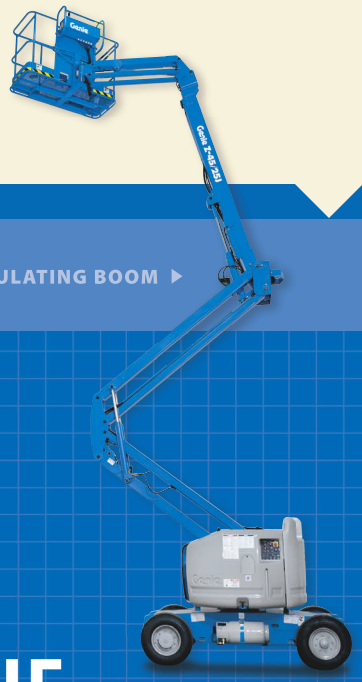

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By WALT MOORE, Senior Editor

IMT Overhauls Lube-Truck Design

Innovative design aspects of the new SiteStar provide configuration flexibility, reduced weight, more efficient pumping systems and expanded storage capacity

Considering that the new IMT SiteStar mobile lubrication vehicle has patents pending for three of its design features, it's obvious that company engineers did not simply warm up an existing concept when developing this new lube truck. And even though the new SiteStar vehicle reflects increased standardization in overall design (compared with the more-or-less custom design of previous Sitestar units), the new vehicle actually offers more configuration flexibility than previous models, while also delivering the added benefits of reduced weight and expanded storage.

This new SiteStar lube truck incorporates an elliptical fuel tank positioned ahead of the redesigned body, which features three added street-side storage compartments.

Two of the new SiteStar body's patent-pending design features center on its product tanks — those for oil-based fluids, antifreeze, water and salvage. Instead of steel, these new tanks are made of polyethylene which, says IMT, provides notable advantages. For example, because "poly" tanks weigh approximately 80 percent less than same-size steel tanks, the total savings in tank weight can amount to as much as 1,800 pounds in certain configurations. Even when accounting for the added weight of the new storage compartments, the net weight savings in these applications can still amount to 1,400 pounds or so.

Another primary advantage of poly tanks, says IMT, is contamination control. Despite a manufacturer's best efforts, says the company, the welding process can leave behind contaminants that can't be completely cleaned from steel tanks. And, of course, steel tanks can rust internally above the product level, creating yet another potential source of contamination.

Also, says IMT, poly tanks are less susceptible to condensation (which creates water as a contamination source), because they are not as sensitive as steel tanks to temperature fluctuations. And to further complement the contamination-control features of the poly tank, each is fitted with a five-micron breather to filter air entering the tank. Also available are 10-micron filters that are positioned between the pump and hose reel in each of the oil-based-product lines.

The polyethylene storage tanks used in the new SiteStar body are lightweight and allow considerable configuration flexibility. The same advantages offered by the new SiteStar lube truck also are available with IMT's SiteStar lube skid, which fits conveniently into the back of the company's Dominator service trucks.

The second of the patent-pending features concerns the configuration flexibility of the poly tanks, which are available in capacities of 75, 135, 190, 260 and 350 gallons. According to IMT, available tank configurations number 22 on the main platform and 12 on the front platform, creating a total of 264 possible tank

configurations. Because the poly tanks are not bolted down and are easy to relocate, the new system provides considerable positioning latitude.

(By contrast, the weight of the previously used steel tanks frequently dictated their position on the deck in order to maintain proper weight distribution. Also, because the steel tanks were bolted to a tank rail that was, in turn, welded to the deck, tank repositioning was difficult.)

Pumping and storage

The product pumping systems for the new vehicle also have been redesigned. Individual, variable-speed hydraulic-motor-and-pump combinations move oil-based products and fuel; air-diaphragm pumps are now used for antifreeze, water and salvage; and an air piston pump conveys grease. New, as well, is the arrangement for the hydraulic motors and pumps. Previously, motor/pump units were individually mounted and plumbed to suit a particular truck's configuration. Now, these units are mounted to a central manifold, which is always positioned in the lower right corner of the hose-reel compartment. This new arrangement, says IMT, contributes greatly to simplified plumbing and easier service.

The new SiteStar design, of course, also can accommodate fuel tanks, which, by regulation, must be constructed of steel. Rectangular tanks with capacities of 480, 650 and 800 gallons are available for mounting on the front platform, as are elliptical tanks with capacities ranging from 1,000 to 2,000 gallons.

Along with changes in tanks and pumping systems, the new vehicle also provides considerably more storage than its typical predecessor. Previous models normally provided about 40 cubic feet of storage in a curbside compartment. The new body, however, has about 110 cubic feet of storage, the added room coming from three additional street-side compartments that result from the standardized design of the main and front platforms.

And, perhaps indicative of IMT engineers not overlooking details in the new SiteStar lube truck's design, the third patent-pending feature concerns a small but nonetheless critical component — new latches for the storage-compartment doors.

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By ROD SUTTON, Editor in Chief

Morbark's model 1600 tub grinder will chew up to 10-foot stumps at a high rate of production, the company says.

Tub Grinder Built with Purpose

Morbark 1600 puts out 700 cubic yards per hour

Touted as the most "purpose-built" machine in Morbark's 50-year history, model 1600 tub grinder purports to put up some impressive production numbers: up to 700 cubic yards per hour in green waste and more than 500 yph in stumps and logs, says Dan Brandon, marketing manager. These numbers can vary depending on material and screen openings, as well as operator and support equipment.

Base diameter measures 11 feet 2 inches, and tub capacity is 20 cubic yards, which Morbark says is the largest made. A choice of Caterpillar or Cummins diesel can provide a minimum of 1,000 or maximum of 1,200 horsepower. The six-foot hammermill offers 22 hammers as standard, allowing enough space between hammers to grind landfill material; mixed debris; and large, chunky wood. In regrind applications, users can convert to a 30-hammer pattern in an hour.

The company says the grinder can easily keep up with a 13-yard bucket feeding it material, and it built the discharge system with a 60-inch-wide belt for quick discharge. Morbark's three-auger system reduces abuse and wear on the belt, Brandon says, which can be damaged by "wood 'spears' that can be shot out of the hammermill at incredible velocity."

"These belts are a high-wear, high-cost replacement item," Brandon says. "Hard-surfaced steel augers are an efficient way to exit large volumes of material from under the mill." A pressure sensor will stop the tub if augers become overloaded.

Also standard on the 1600 is the company's Iqan system, although this is the first tub grinder that features the programming tool. A computer module receives input from hundreds of sensors that monitor hydraulic pressures, temperatures, loads, auger pressure, and other functions, Brandon says. The operator can set parameters based on the material in order "to achieve the greatest output while maintaining the optimum engine load."

"For example," he says, "if the discharge augers come under heavy load because of a large surge of material, the Iqan senses this and tells the tub rotation to slow down or even stop and reverse until the load on the augers reaches optimum parameters." In addition, Iqan has an optional satellite link that allows a service tech to monitor and diagnose problems.

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Model 1600 Specifications

Gross engine power	1,000 to 1,200 hp
Tub diameter, flare	15′
Rotor type	Hammermill
Transport length	49′ 4″
Transport width	11′ 11″
Transport height	13′ 6″
Operating weight	90,980 lb.

Source: www.Spec-Check.com

Model 1600 runs from $650,000 to $700,000 depending on power unit and options. Standard machine warranty is 6 months. For specs on this and 71 other machine types, visit ConstructionEquipment.com.

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By HEATHER BURLINGAME, Senior Production Editor

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Bobcat

The HB1180 hydraulic breaker meets the 750-ft.-lb. impact energy class and is approved for use on Bobcat skid-steer loaders, compact track loaders, the all-wheel-steer A300 and compact excavators. The auto-power feature is an automatic pressure regulator that ensures maximum performance of the tool regardless of hydraulic-flow variation in the carrier vehicle or temperature.

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Goodyear

Designed for pickup trucks, Goodyear's Wrangler tire features SilentArmor Technology Pro-Grade. A new chip- and chunk-resistant tread compound enhances tread wear in heavy loading and towing applications. Two high-tensile steel belts and a layer made with DuPont Kevlar help absorb road noise and provide a smooth, quiet ride, according to the company. The tire fits most popular heavy-duty/super-duty pickups, including Ford F-250 and F-350, Chevy/GMC 2500 and 3500, and Dodge 2500 and 3500.

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Ground Heaters

Ground Heaters Dryvex MC4500 incorporates a convection-based system that utilizes heat and air movement by using outside air. Air is conditioned to low relative humidity and blown into a building through flex ductwork, where it absorbs moisture. Air flows at 4,500 cfm, allowing the unit to dry up to 15,000 square feet at saturation or up to 270,000 cubic feet of space, removing up to 900 gallons per day. Weighing 6,500 pounds, the unit is powered by a 7kW Kubota Dura-Gen diesel with a 125-gallon fuel tank.

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Ingersoll Rand

Ingersoll Rand attachments fit any skid-steer or compact track loader. The line includes box blade, pallet forks, industrial grapples and three compact buckets. Bucket offerings are general-purpose, heavy-duty and combination buckets in various sizes.

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Loegering

The Mud Bucket for skid-steer and track loaders hauls ½ yard of concrete, depending on the host machine's capacity. Then the attachment's hydraulic gate unloads the material. The Extension/Reduction chute reduces to a 9-inch-wide opening for accurate placement. Loegering says the Mud Bucket is spill-proof on most terrain.

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ConocoPhillips

Three engine oils meet the API CJ-4 standard for diesel engine lubes. Each was designed for use with 2007 low-emission engines. Guardol ECT and Kendall Super-D XA are premium synthetic-blend oils for use in diesel engines using exhaust aftertreatment devices; both can also be used in older engines. Fleet Supreme EC engine oil is designed for fleets that seek "economically efficient" oils, the company says.

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Market Watch Lite

Blastrac

The 1-8DPS30 self-propelled 8-inch shot-blasting system prepares concrete surfaces prior to coatings or overlays. The unit is designed to strip, clean and profile projects up to 8,000 square feet, and works at 430 square feet per hour. A self-propelled drive motor promotes a consistent surface profile, the company says.

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Genesis

Designed for excavators in 70,000- and 100,000-pound classes, respectively, GXP 660 MAXX and GXP 990 MAXX shears are billed as providing power generally found in a shear one to two sizes larger. Models feature a bolt-on piercing tip; dual guide blades; and four identical, four-way indexable blades.

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Ground Heaters

Dryvex R110 and R55 commercial dehumidifiers use refrigerants to pull moisture out of the air as it passes across the evaporator coil. R110 pulls 471 cfm and has a capacity of up to 229 pints per day at 90-percent relative humidity and 90 F. R55 has an airflow rate of 294 cfm and can handle 600 square feet with 8-foot ceilings.

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Leica

Disto A6 handheld laser distance-measuring tool features Bluetooth technology for wireless transfer of data to a pocket PC or laptop. Leica provides software that allows the data to be exported to programs like Excel, Word and AutoCAD. Like the Disto A5 introduced in '05, A6 takes measurements within 1/16 inch at ranges to 650 feet. It comes with a two-year warranty.

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Bobcat

A line of Brushcat rotary cutters includes five models with varying hydraulic-flow requirements to accommodate loaders with flows ranging from 15 to 37 gpm. The Brushcat is available in widths of 60 and 72 inches and is approved for use with certain models in Bobcat's skid-steer-loader and compact-track-loader lines, as well as with the A300 all-wheel-steer laoder and the company's 5600 utility work machine.

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Ascorel

Ascorel offers the MC 382 and MC 402 weighing systems for wheel loaders. The display unit is water, dust and vibration resistant with a larger screen dimension than preceding MC 380 and MC 400 models. MC 382 can store ten references. MC 402 has all the functionality of the MC 382 and includes management tools for communication and data analysis. It communicates via radio, GSM or USB and can store data on more than 100,000 loads.

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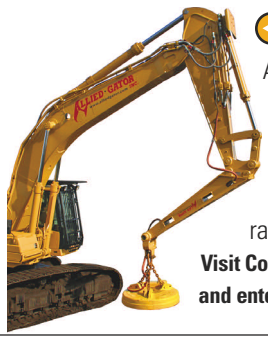

Allied-Gator

Allied-Gator MT Series Mag Extension enables excavators to perform functions comparable to a dedicated material handler with a magnet, providing an expanded range of motion, the company says.

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Knaack

Weather Guard sliding ladder rack loads up to an 8-foot A-frame or extension ladder. The modular system has adjustable front and rear cradle assemblies that run along a rail. The rail is attached to the inside roof of the vehicle and holds a ladder in place with a tension-locking device. There is no need for buckles, latches or ties.

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Market Watch Lite

National Attachments

Mobile Integrated Screening Unit (MISU) features the Spinning Rotor System to push smaller particles through and hold back the larger debris. Floating rotors shed material that would otherwise stick to them to prevent clogging the discharge envelope. With a ¾- to 3-inch screening range, MISU works in tight spaces.

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Hotsy

HWE series hot-water pressure washers run entirely on electricity. Water heats in a stainless-steel coil, which lies in a tank of water solution for instant hot water when the washer is plugged in. With no noise or fumes, the company claims HWE pressure washers are ideal for industrial cleaning indoors. The machines are compact, feature auto start, and are backed by the company's 7-year warranty. Power ranges from 2,000 to 3,000 psi, and volume ranges from 3.46 to 3.9 gpm.

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Chevron

For heavy-duty manual transmissions, Delo Synthetic Transmission Fluid SAE 50 and Texaco Syn-Star TL SAE 50 provide reduced component wear and potential fuel economy improvements. The all-season synthetic lubricants feature high viscosity and low pour point. The transmission fluids come with the Chevron Delo and Texaco Bumper-to-Bumper Lubricants warranty.

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Power Curbers

5700-Super-B can slipform concrete foundations for steel cable with a post-hole digger attachment. It digs holes to 34 inches deep with the attachment, which mounts on the left rear. The auger operates inside a cylinder and moves dirt into a hinged chute. The chute transfers spoil out of the way of the slipform application.

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Bobcat

The 84-inch sweeper attachment has a floating bristle head that follows surface contours independently of the bucket. Other features include direct-drive motor, solid-mounted hood, and optional wheel kit and gutter-brush accessories. The wheel kit protects surfaces when the wheels engage the surface. Two mounted caster wheels with gas shocks are included in the kit.

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Blastrac

The 3-28DC dust collector has three motors and collects concrete dust in surface preparation jobs. Vacuum has resin-reinforced, pressure-molded plastic chassis and body. Motors and filter assembly are protected. Specially designed filter allows concrete dust to be dislodged by a manual shaker incorporated into the design. Pan capacity is 50 pounds, and a silencer keeps motor noise at 70 dB(A).

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ITT Flygt

The BS-2750 submersible pump is designed for corrosive liquid with a pH range of 2 to 10. The unit is 11 inches in diameter — ideal for tight spaces — and is available in 230/460/575-volt three-phase versions. Rating is 13 horsepower. The pump delivers to 300 gpm of liquid and 15 starts per hour. Built-in thermal sensors provide overload protection.

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Topcon

GR-3 RTK GNSS satellite receiver captures signals from GPS, Glonass and the European Union's upcoming Galileo system. Topcon says the GR-3 will withstand a fall from a range pole and backs the system with a "bullet-proof" warranty. Features include a two-watt 915+ internal radio for interference-free RTK communication and optional internal GSM/GPRS SIM card modem.

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Leica

To help prevent equipment theft, Leica has added optional PIN codes to the TPS400 and TPS800 total stations. Leica dealers can add the PIN-code function to existing units. All Leica total stations and GPS instruments are PIN-code capable at this time.

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Luber-finer

Luber-finer's MXM Force air filters use what the company calls MicroGold Fiber media, which provides more pleats for added protection. Pleat stabilizer locks and adhesive beads prevent pleat movement and pleat collapse for long filter life.

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Sage Oil Vac

Professional Series model 21120 with remote operation features four 60-gallon new fluid tanks and one 120-gallon used fluid tank. The evacuations process moves used oil or fluid into an enclosed Oil Vac tank. By pressurizing new fluid tanks, new fluid is then delivered to the engine. The unit has no pumps and is fully enclosed.

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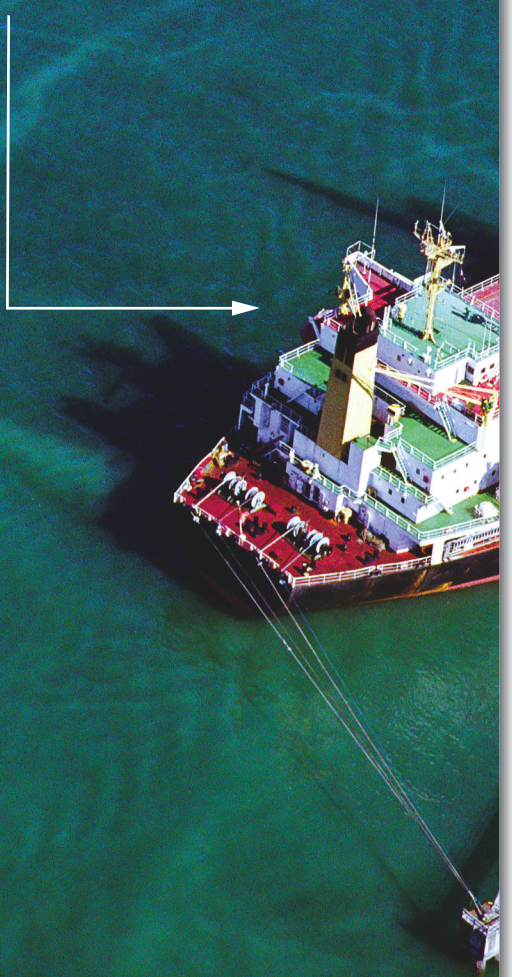
A. is overdue for maintenance

B. was used for 6 hours on Sunday

C. is on its way to parts unknown



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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

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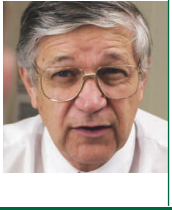

Mike Vorster is the David H. Burrows Professor of Construction Engineering at Virginia Tech, where he has taught since 1986. His teaching and research interests focus on construction equipment, contract administration, and contract dispute resolution. He is the academic advisor to the Association of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

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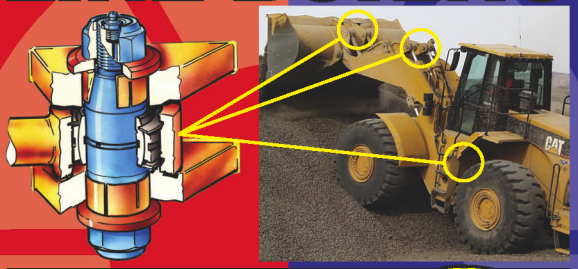

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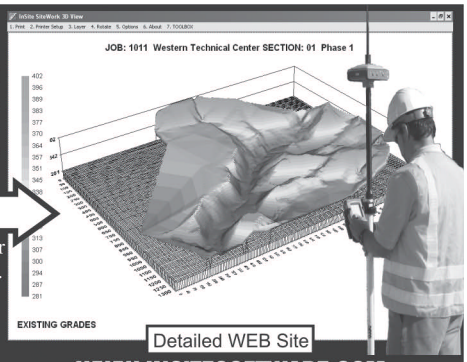

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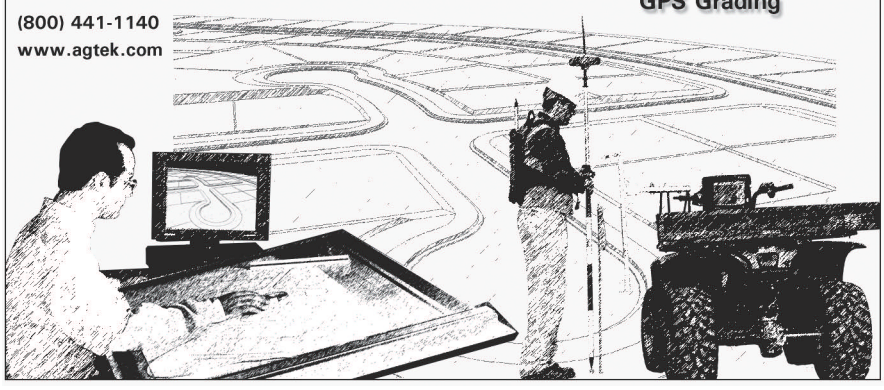

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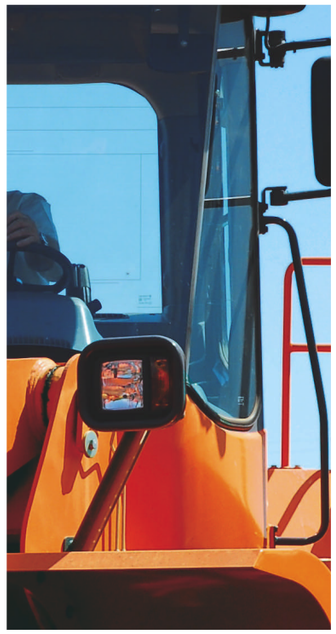

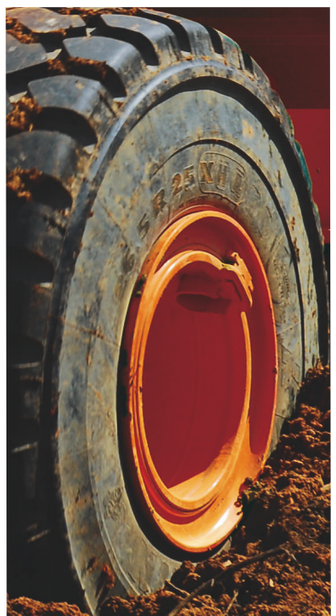

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