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38 How to make quieter concrete roads



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March 2007
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Beast with a Blade

Gehl 7810E handles attachments with power, finesse

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Cover photo: George Pfoertner ©

FEATURES

COVER STORY: Paving Technology

30 Promising Developments in Asphalt, Concrete

The paving industry, whether placing asphalt or concrete, is continually challenged to produce improved end-products – smoother, safer, longer-lasting roads – and to produce them more efficiently. In this issue's special Paving Technology report, we consider two hot topics. The hot asphalt topic is actually "warm," as in warm-mix, and examines the benefits of producing and placing mixes at lower temperatures. And for the concrete-paving community, we examine the issue of quieter pavements, taking particular note of research surrounding this concern.





HANDS-ON-EARTHMOVING

46 You Sure This Is a Skid-Steer?

Considering that the new Gehl 7810E's rated operating capacity of 3,850 pounds qualifies it as the largest skid-steer around (except, of course, for its twin in the Mustang line, the model 2109), we thought the machine was a fitting subject for a Hands-On Earthmoving evaluation. Professional operator Tom Rush from Local 150 uses the 7810E with some heavy-duty attachments and nicknames the machine a "grizzly bear."



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SPECIAL REPORT: FUEL

52 Ultra-Low Sulfur Takes the Dirt Out of Diesel

While only required in 2007 engines, the transition to almost-sulfur-free fuel is changing the shape of U.S. diesel use. Executive Editor Larry Stewart does extensive research and tells you everything you need to know about ULSD.

HANDS-ON TRUCKING



59 Heavy Hybrid Motors Smartly

Volvo Group hosted a briefing/demonstration in Washington, D.C., on its hybrid vehicle projects. And Mack, which is building six heavy hybrid trucks for the Air Force, showed off two of them – both Granite dumpers. Truck Editor Tom Berg drives one of them and says it operated so easily that a GI driver might not know how special a vehicle this is.

SNEAK PEEK



65 Asphalt Products on the Show Floor

World of Asphalt will take place March 19-22, 2007, in Atlanta. For those who are unable to attend the show, we bring you a sneak peek of some exhibitor highlights. For more information, visit www.worldofasphalt.com.

BUYING FILE

74 Asphalt Pavers Out to Do More

If the current generation of construction equipment has one overwhelming differentiation, it is in the proliferation of multi-purpose machines. In many equipment types, the single-purpose unit has all but been eliminated. If you're thinking full-sized asphalt pavers are just that, Senior Editor Mike Anderson says "think again."



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Bigger Tools in the Box

The groundhog told us spring would come quickly this year, but 10 days later a blizzard reminded us that we live in the upper Midwest. As one wheel loader operator explained how he had to drive in circles around a mall parking lot in order to keep up with the blowing snow, our eyes were drawn to the machine's blade.

Attachments have become big business as machines no longer perform single functions. Wheel loaders, skid-steers, excavators and others have become carriers for various types of tools. Fleet operations must now manage buckets, couplers, and asphalt grinders. The list goes on and grows monthly.

Recently, *Construction Equipment* queried subscribers about hammer usage on skid-steer loaders, backhoe-loaders, and excavators. Our research revealed that 95 percent of the machines were used with attachments.



Rod Sutton, **Editor in Chief**

We welcome your comments.
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Although one-third of respondents purchased attachments with the machine, about half say they buy attachments separately and 40 percent rent. We asked respondents for all the ways they acquire attachments, so many use more than one method. For equipment managers researching attachments, our online manufacturer database includes hundreds of listings (including 30 manufacturers of snowblowing attachments, by the way). Our specifications database covers breakers, hammers and shears.

Managers used to measuring productivity of whole machines must now consider the productivity of their attachments. They must ask: What tools work best in various applications; do we buy or rent the attachment; how do we maintain the tool, or is it a commodity that we use and replace; and how many of each do we need on hand? Attachments replace hand labor, too. How do managers help their operations folks decide what applications can be done more efficiently with an attachment than with a crew of laborers? These are all tough questions, but as attachment manufacturers introduce innovative tools for the industry's carriers, managers must start asking them.

Let us know what's worked for you. Tell us your stories about attachments that performed in specific applications, or tell us how you have answered these tough questions. At the end of the online version of this article, use TalkBack to start the conversation. We'll see where it goes.

Rod

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With ever-changing soil conditions and asphalt mix designs, proper compaction can be tricky, even for an experienced operator. Over- and under-compaction can impact the success or failure of a road, runway or other surface, leading to costly repairs and rework. On the other hand, knowing when compaction is complete can increase efficiency and eliminate performance penalties.

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MARKET WATCH

By KATIE WEILER, Managing Editor

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

Ingersoll Rand



The 600-hp MT-2000 milling machine features a Tier 3 Cummins engine. The four-track, front-load, half-lane machine offers three drum-cutting speeds, which the company says is an industry first. Deep-cut power bulge provides higher torque at lower engine rpm for tough material or deep-cut applications. High-speed selection provides maximum speed on shallow cutting depths. The milling machine can run 78.75- and 86-inch drums. Five steering modes provide maneuverability.

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Compact Equipment



Boxer 530X mini-skid replaces model TL-224-34. The 530X features an integrated track system that retracts to a width of 35 inches from its fully extended 43.5-inch width. The machine has a rated operating capacity of 825 pounds at 50 percent of its tip capacity and it has 76 inches of clearance under its bucket hinge at full lift.

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Vermeer

The HG200 compact horizontal grinder is designed for use in confined urban areas. With the same platform as the BC1000XL brush chipper, this unit has an 85-hp turbocharged Cummins; a gross weight of 5,500 pounds; and can be towed with a 1-ton truck. Hammermill drum can process light contaminants such as nails. A lid directly overhead the hammermill and screens has hinges over the center to allow full access for maintenance. Infeed conveyor measures 17 inches wide, 4 feet long, with an optional 2-foot extension.

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Kubota

An electronically controlled hydrostatic transmission called HST Plus gives operators of Kubota's new Grand L40-series compact utility tractor four ways to control performance: 1) Dialing in one of 13 response speeds to the HST pedal; 2) Automatic or manual mode for Hydro Dual Speed (H-DS), which adds high and low shifting on the roll within each hydrostatic speed range for six speed options; 3) Load-sensing Stall Guard mode automatically regulates engine power to the wheels, preventing engine stall under load; and 4) Auto-throttle-advance synchronizes tractor speed and engine revolution with the HST pedal, reducing fuel consumption.

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Market Watch

Komatsu

In the transition to Tier 2 compliance, Komatsu replaced the twin-engine PC1800 excavator with the single-engine PC2000LC-8, gaining nearly 50 horsepower and driving a major shift toward simplicity. The 443,000-pound PC2000LC-8 is powered by Komatsu's 956-hp SAA12V140E-3 diesel. Four much-larger hydraulic pumps replace the PC1800's 10 pumps. With a 15.7-cubic-yard bucket, the new machine is designed to load a 100-ton truck (like Komatsu's new HD785) in four to five passes.

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Haulotte

The new HB135 JRT telescopic boom reaches a platform height of 134 feet — third highest available in North America today. The boom has a fly jib with 140 degrees of range. A new platform load controller, 4-degree tilt alarm allowable in all positions, hydraulic platform compensation, and stability management in all positions keep operators safe in the big boom.

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MLE

Man & Material Lift Engineering says its T40MH-3000 Quad Lifter can replace telehandlers and small cranes on some building sites. The 40-foot boom (built on a 60-foot boom's carrier) is said to have the greatest capacity in the industry at 3,000 pounds. Booming down to 38 feet crosses the threshold that derates the capacity to 2,500 pounds, which is still the most capacity in class. A Load Sensing Platform shows the operator how much weight is on the platform. It also features quick-attach hardware.

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Komatsu

The HM400-2 articulated dump truck features Komatsu's electronically controlled countershaft transmission with K-ATOMiCS, which is also used in the company's rigid dump trucks. This technology is said to ensure smooth shifts without shock and maximize power-train life. The truck is powered by a 438-hp turbocharged Tier 3 engine. The body has a heaped capacity of 29.2 cubic yards and a loading height of 9 feet 9 inches.

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Terex

Terex upgraded the TXC300 LC-2 excavator with a Tier 3 Daewoo engine whose electronics interface with the hydraulic-system controller for what Terex claims is a 4 percent improvement in productivity and 6 percent better fuel efficiency. Oil-change intervals have doubled to 4,000 hours, and air-filter replacements quadrupled to 2,000 hours. A new attachment flow-rate control allows the operator to adjust auxiliary oil flow to suit the tool.

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Grove

The seven-section main boom of the GMK4100-L all-terrain crane, a long-boom version of the GMK4100 launched last year, telescopes to its 198-foot full height in less than nine minutes. Addition of a jib extends tip height to nearly 274 feet. The new carrier cab includes Grove's ECOS electronic control system and a high-visibility control panel. The carrier is powered by a 396-hp Mercedes-Benz engine.

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Hyundai

The R35Z-7 is the first zero-tail-swing mini-excavator developed by Hyundai. With offset boom, the machine works in very narrow spaces, yet Hyundai claims the cabin provides as much space as a standard machine. The R35Z-7 weighs 8,000 pounds with a .14-cubic-yard standard bucket, and has a 27.5-hp Yanmar engine. Digging depth is 10 feet 5 inches and dump height is 11 feet 5 inches.

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Imer Group



The SPIN 15 continuous cycle mixer is designed to quickly mix a broad range of ready-mixed materials (plasters, coating mortars, adhesive mortars for tiles, self-leveling materials and more). This model can be combined with a plastering pump or a mortar pump. With a gear motor directly driving the agitator, the SPIN 15 produces 4 to 5 gpm.

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New Holland



The 57-hp New Holland engine propels the C175 compact track loader at travel speeds up to 4.6 mph, thanks to its standard two-speed transmission. The Super Boom vertical lift linkage speeds boom and bucket cycle times, and eliminates frame towers for excellent rearward visibility. Features include an air-conditioned cab and pilot controls.

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Liebherr

The 105-hp LR 624 Litronic, with Liebherr's hydrostatic drive, competes at about 35,000 pounds. Electronic control of the Liebherr D 934 S diesel delivers maximum torque for the level of power required, and produces rated power output at just 1,800 rpm. All drive and steering movements are controlled by a single joystick.

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New Holland

The W170B and W190B wheel loaders are powered by the latest generation, CNH Tier III engines. The W190B's power has increased 13 percent to 195 horsepower, and torque increased 16 percent. The W270B is fitted with a Cummins Tier III engine delivering its 320 horsepower peak at 1,000 rpm, compared to 1,200 rpm in the previous model. All models now feature a ZF Powershift transmission with four forward and three reverse gears.

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Volvo

Volvo promises more power, more torque, more load capacity, and faster cycle times with the L350F wheel loader replacing the L330E. The Tier 3 528-hp Volvo D16E LA E3 engine delivers 26 more horsepower. A new Volvo transmission adds torque-converter lockup capability. Axles are new, as is the larger cab.

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Atlas Copco

The Demolition Pulverizer DP 2800, with 110 tons of crushing force, replaces the DP 2500. Its wide, straight jaw and rotation gear allows the 6,300-pound pulverizer to be positioned quickly.



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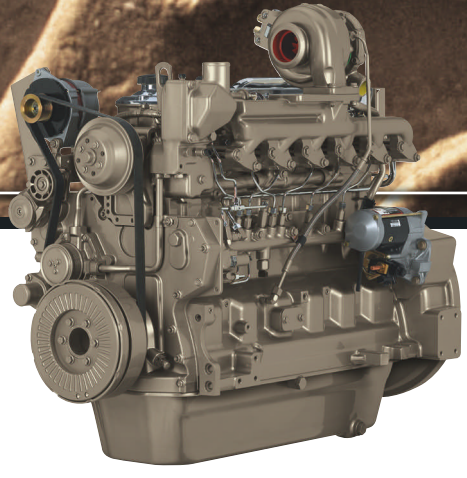

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LEGISLATIVE NEWS

Push On for Full Natural Gas Use in New York State


Joseph Darling

As pleased as Joseph Darling is by the New York State Department of Transportation's use of natural gas fuel today (see Great Managers, February issue), he knows there's so much more that can be done.

Darling, the department's director of fleet administration and support, would like nothing more than to take the benefits firmly established in the department's light-duty fleet and fully extend them to the extensive heavy-duty truck and construction fleets.

The problem for him is a state-wide legislative moratorium placed on liquefied natural gas (LNG) following a fatal 1976 industrial accident on Staten Island. The accident, the result of a welding mishap unrelated to LNG itself, just happened to take place in an LNG facility, he said.

"We have been working for the past five or six years to get new legislation on the books that would allow us to introduce LNG storage facilities for fueling across the state, but every time we get close, something happens," said Darling. "Right now, the thing that's rearing its ugly head is the Broadwater Project in Long Island Sound."

Under the proposed Broadwater Project, LNG would be shipped in from the Middle East and stored in an offshore terminal. Environmental and security issues are being raised, and Darling himself shares those concerns, which he also deems unnecessary.

"There would be enough LNG from methane if we developed our own distribution system for it."

Frustratingly for Darling, other than the common material being LNG, the Long Island Sound proposal has nothing to do with his plan to build on-land storage facilities throughout the state.

"But we are still moving forward. We are hopeful that the LNG legislation could be approved in the new legislature (which took effect Jan. 1 under new Gov. Eliot Spitzer)," he said.

"Hopefully, we can show the wisdom to the new administration to continue support for this and move forward and get past the hurdles we've had, because this really is important from a cost standpoint."

— MIKE ANDERSON

MANUFACTURER NEWS

Volvo to Acquire IR Road Development Business

Volvo will purchase Ingersoll Rand's road development division for $1.3 billion, pending government approval, later this year.

The purchase includes heavy compactors, asphalt pavers and milling machines, as well as Ingersoll Rand's material-handling equipment. The acquisition fits into Volvo's current operations within motor graders and "positions Volvo as a full-range manufacturer of heavy road-construction equipment," says Tony Helsham, president of Volvo Construction Equipment.

The acquisition includes 20 dealerships in North America and distribution companies in Europe and Russia. "Geographically, the purchase provides attractive growth possibilities by capitalizing on the common dealer network in North America, Europe and Asia," Helsham says.

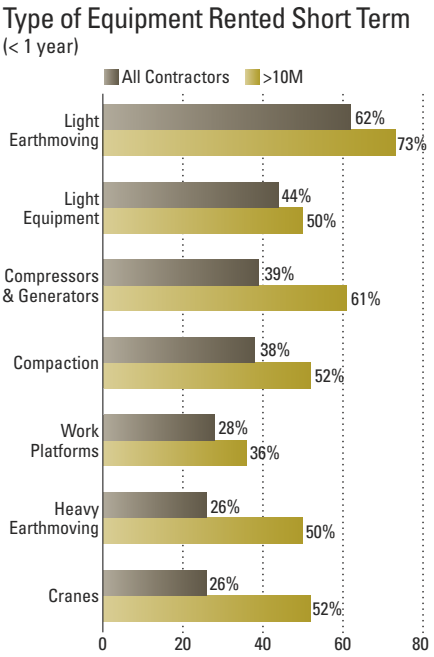
EXCLUSIVE RESEARCH

Rental Grows Among Big Contractors

Every year about 65 percent of contractors responding to *CE*'s Annual Report & Forecast survey say they have used short-term rentals, but 82 percent of firms with fleet replacement values of $10 million and more say they rent short term.

The disparity in rental usage between different fleet sizes continues when asked about the change in rental hours purchased. For all contractors, the number consistently hovers around 25 percent (it was actually 24 percent in 2006), but 31 percent of firms with $10 million and larger fleets increased rental hours used.

— LARRY STEWART



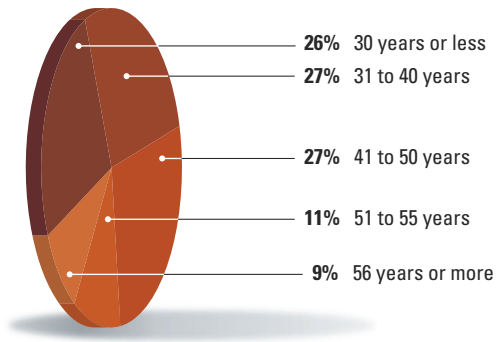
Source: 2007 CE/Case Construction Equipment *Annual Report & Forecast Survey*

LABOR SHORTAGE

Survey Shows Dealer Technicians Aging

Recent research by The AED Foundation shows that 20 percent of technicians working for construction equipment distributors are older than 50. Nine percent are 56 years old or older. Respondents also indicated that they expect 5.3 percent of their technicians to retire during the next five years. The AED Foundation is an affiliate of Associated Equipment Distributors.

Age of Dealer Technicians
(% responding)



INDUSTRY NEWS

New Emissions Technologies Come With Their Share of Headaches

J.D. Power and Associates' 2006 Heavy-Duty Truck Engine/Transmission Study released Oct. 5, 2006, indicates that the average number of reported engine problems has increased to 74 PP100 (engine problems per 100 vehicles) — up from 46 PP100 in 2005. The study is based on the responses of 2,529 primary maintainers of two-year-old Class-8 trucks.

"In the 2005 study, there was a greater mix of manufacturers using old- and new-technology engines, so we're just now starting to see the overall impact of the emissions regulations [which brought about exhaust-gas-recirculation, ACERT, and other engine technologies in 2004 and 2005]," said Brian Etchells, senior research manager in the commercial vehicle group at J.D. Power and Associates. "Whenever a new technology is employed, it takes a while to work the bugs out. As time goes on and engines are better equipped and designed to follow the emissions standards, the number of problems should gradually decline."

The study also finds that among the four drivers of engine satisfaction, customers are least satisfied with the cost of ownership, particularly in the areas of routine engine maintenance costs and fuel efficiency. Reported fuel consumption for heavy-duty engines has declined to 5.72 mpg in 2006 — down from 5.91 mpg in 2005 and 6.04 mpg in 2004.

EQUIPMENT MANAGEMENT

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■ Keep accurate inventories, recording the manufacturer, model number, year, PIN and purchase date for each piece of equipment. Also record the serial numbers of each major component (engine, transmission, final drives, etc.).

Consider registering equipment with a national database.

■ Focus on physical site security. When possible, fence in your equipment. Park equipment close together and in a circle if feasible, with smaller pieces in the center. Chain small equipment to larger equipment.

Communicate with law enforcement. Request more frequent patrols, especially in known high-theft areas.

■ Use theft deterrents and recovery systems. Use immobilization devices such as wheel locks, fuel shut-offs or ignition locks. Consider installing battery-disconnect switches. Use a proven tracking-and-recovery system that offers time-tested tracking technology and is integrated with police so that recovery is in the hands of the law.

MANUFACTURER NEWS

Trimble to Acquire Meridian

GPS grade-control provider, Trimble, plans to acquire privately held Meridian Project Systems, developers of enterprise project-management and lifecycle software. Building owners, constructors, engineers, and government agencies use Meridian technology to reduce construction costs and improve project productivity. Meridian contributes major elements to Trimble's Connected Construction Site strategy, built on efficiencies achieved by integrated information delivery throughout a project's plan, build and operate activity cycle.

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WOODY WELD, PRESIDENT OF ACME LIFT COMPANY, speaks from experience when he talks about using the GlobalTRACS® equipment management system.

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"GlobalTRACS changes everything," Woody says. "It changes your ability to run your business. It changes how you relate to your customers. It changes how you manage dispute and conflict. Without it, we'd be back in the Stone Age—where so many equipment companies still are."

"For me, investing in this technology is all about *survivability*—of both the wireless equipment and the company that stands behind it," Woody advises. "In both cases, nobody beats QUALCOMM."

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MANUFACTURER NEWS

PacLease Targets Vocational-Truck Users

According to Olen Hunter, director of sales for Paccar Leasing Co. (PacLease), the company rolled out a new full-service leasing program for users of vocational trucks. When we visited with Hunter at the recent World of Concrete Show, he told us that PacLease is experiencing 16 percent average annual growth. As the numbers expand, he says, more vocational trucks are included.



PacLease allows customers to specify new Kenworth and Peterbilt vehicles that meet their operational requirements.

According to Hunter, leasing can assist users by helping reduce certain "hidden" costs, including fleet administration, regulatory compliance, technician recruiting/training, shop equipment and the cost of working capital invested in parts inventory. In addition, he says, the off-balance-sheet accounting treatment that leasing affords preserves the user's credit lines.

PacLease assists vocational-truck users by first specifying vehicles that exactly meet their operational requirements, then by tailoring lease terms and flexible maintenance options that best suit their business. Also, at the initiation of the lease, an end-of-contract value for the truck is established via a Terminal Rental Adjustment Clause (TRAC), For details, visit www.paclease.com.



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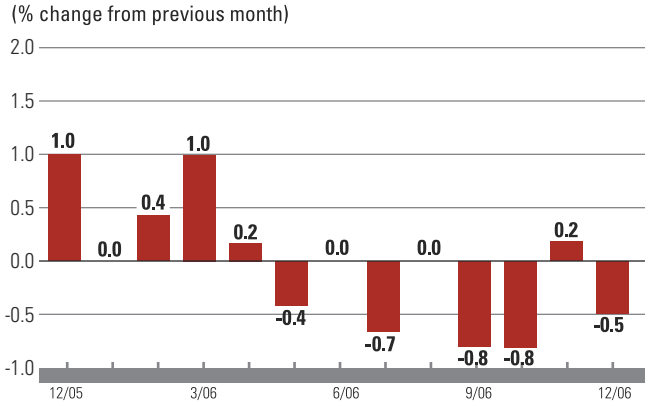
By JIM HAUGHEY, Director of Economics

TOTAL CONSTRUCTION SPENDING

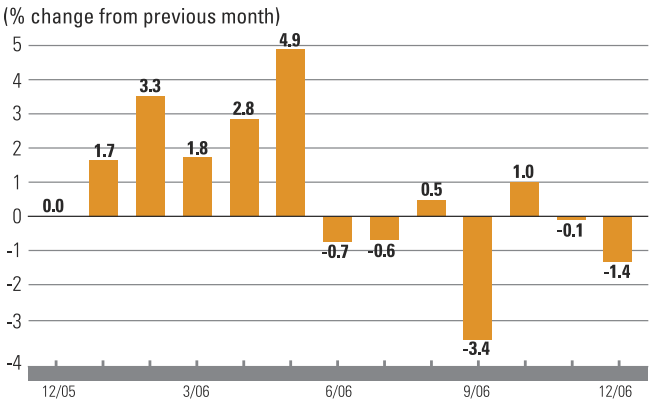
Spending declined 3 percent since the peak level in April 2006, with the slow decline likely to continue into the opening months of 2007. Construction spending in spring 2007 will be unchanged from spring 2006. Jobsite activity should begin rising again when the housing starts slump ends, but the increase for the full year will be less than 3 percent, below project cost inflation. Nonetheless, double-digit spending gains are forecast for both nonresidential buildings and non-building projects in 2007.



Source: U.S. Department of Commerce

HIGHWAY CONSTRUCTION SPENDING

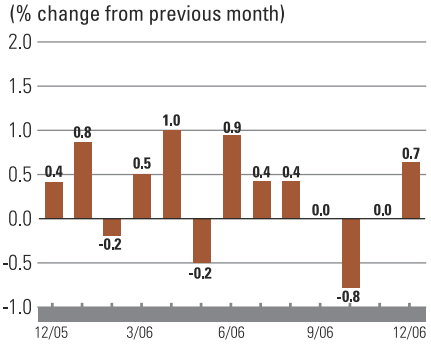
Spending surged to a peak in May 2006, then declined 5 percent, including cost increases, through December. This was the result of budget problems from large cost increases and the continuing delay in the scheduled boost in federal funds for FY 2007. Current spending is 10 percent above a year ago, and this growth trend is expected to continue through 2008. Pavement spending is only 2 percent higher than a year ago, but bridge spending is up 32 percent.



Source: U.S. Department of Commerce

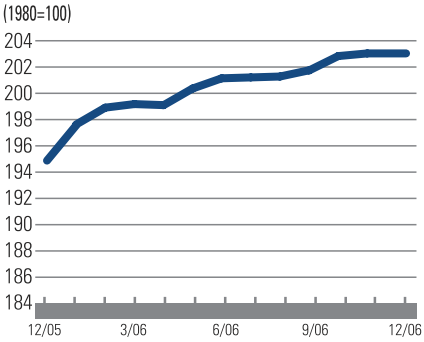
MANUFACTURING PRODUCTION

Factory production has been restrained by cutbacks in residential construction materials and motor vehicles and has increased at only a 1.5-percent annual pace since April. Inventories are still modestly excessive in many industries, so production growth will be negligible for the next few months and then recover to about the same pace as the overall economy when inventories are back in balance. Factory capacity is currently stressed in the primary metal, electrical, food, oil, plastics and mining industries.



CONSTRUCTION EQUIPMENT PRICE INDEX

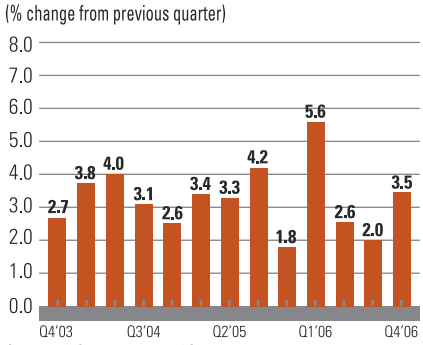
The index was unchanged during the last three months of 2006, reducing the year-over-year inflation rate to 3.4 percent. The recent pause in price increases is temporary. A 3-percent rise in the price index is expected in 2007. Although sales have been steady for about a year, manufacturers still have a 15-week order backlog. Rising orders from foreign buyers and from equipment suppliers to nonresidential building sites offset lower orders from residential contractors and rental services.



Source: U.S. Department of Labor

GROSS DOMESTIC PRODUCT

Growth surged to 3.5 percent in the final quarter of last year. This was a temporary burst of spending after two very sluggish quarters. Consumers went back to the mall when oil prices fell. GDP growth is expected to average in the 2.5-to-3.0-percent range well into 2008. This subpar growth will permit a slight easing of inflation, but is still enough to keep credit costs steady and support continued above-average expansion in nonresidential construction.



Source: U.S. Department of Commerce

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



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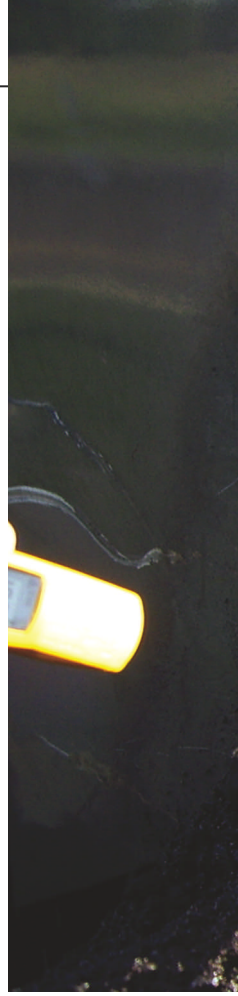
By WALT MOORE, Senior Editor

Potential Benefits Heat Up as Temperature Cools



Warm-mix asphalt looks promising, but caution prevails, lest we step backward in regard to present pavement quality

Not too long ago, some smart people in the asphalt-paving industry got to thinking about the potential benefits of reducing the temperature at which asphalt mixes are produced and placed. Instead of conventional hot-mix, which typically is loaded into trucks at the plant in the temperature range of 280F to 325F, why not a "warm-mix" that could be produced at temperatures in the range of 180F to 260F?

What might be the potential benefits of dropping the temperature? Chief among them, perhaps, would be the reduction of fuel burned in the production process, translating into lower energy costs, of course, but also translating into a reduced volume of "green-house gases" from the plant's stack.

Some scientists believe that an excess of greenhouse gases from man-made sources (mainly carbon dioxide from burning fossil fuels) may be collecting in the Earth's atmosphere, upsetting the natural balance of gasses that regulate the amount of heat (infrared radiation) that escapes from the Earth through the atmosphere. Trapping too much heat, some say, contributes to the suspected phenomenon of global warming.

During the past 30 years or so, pollution-control devices have significantly reduced emissions from asphalt plants. But, that said, air-quality regulators still perceive the creation of greenhouse gasses from fossil-fuel combustion (no matter the source or its degree of contribution) as a significant environmental problem. Understandable, then, is the asphalt industry's concern about inefficient fuel use.

For example, says David Newcomb, P.E., Ph.D., vice president of research and technology for the National Asphalt Pavement Association (NAPA), mixes made with polymer-modified binders are considered by some as more difficult to work than mixes with unmodified asphalts. In an effort to improve workability of these mixes, he says, the producer may raise production temperatures. Elevating temperatures also may be considered, says Newcomb, for easing production of mixes containing aggregates of greater angularity (requiring increased mixing force), or for creating compaction-friendly mixes that must meet high-density specifications.

"Increasing production temperature to address these concerns seems expedient, but often is not effective," says Newcomb. "For lit-



WMA produced with the Evotherm chemical package is delivered to the paver at a temperature of 220F.
Photo: Asphalt Innovations/ MeadWestvaco

tle or no improvement in workability, increasing mix temperature results in increased plant emissions and fumes at the paving site."

Beyond fuel and emissions

While the concept of warm-mix asphalt (WMA) goes to the heart of potentially mitigating emissions and fuel-use concerns, it also offers the prospect of greater flexibility when transporting, placing and compacting the mix.

"When a mix is produced at a lower temperature, the rate at which it loses heat is lower, which means there may be a longer period of time that it remains workable," says Newcomb. "Haul distances and time for compaction may be increased."

In addition to potentially longer haul distances, the ability to pave and compact asphalt mixes at cooler temperatures could, further, allow an extended paving season. And, with regard to compaction, not only might the compaction-time window be opened a bit wider, but greater in-place densities also may result, because WMA is demonstrating an ability to compact more easily than conventional hot mixes.

Newcomb notes, too, that the asphalt binder's aging is directly related to production temperature, and if temperature is reduced, so is the oxidative hardening of the binder. Going easier on the binder when producing the mix, he says, could mean more pavement flexibility and improved resistance to cracking.

At the paving site, of course, placing the mix at a lower temperature could significantly reduce fumes, complementing fume-extraction systems already fitted on pavers. And, relatively speaking, the work site would be cooler. In a European field trial of a particular WMA formulation, for example, paving temperature was 194F, compared with a conventional-hot-mix control section placed at 320F.

Considering the potential benefits derived from lowering the production and placement temperatures of asphalt mixes, it's understandable that the asphalt-paving community is devoting considerable resources to determine if the WMA concept can deliver on its promises. WMA has been used on a number of demonstration projects here at home, and on a few significant projects elsewhere in the world. Results have been promising, but caution prevails, lest we step backward in regard to present pavement quality.



Last June, the National Asphalt Pavement Association, the Wisconsin Asphalt Pavement Association, the Wisconsin DOT, and Payne & Dolan Inc., a paving contractor headquartered in Waukesha, Wis., sponsored a WMA open house. The event included paving demonstrations with Evotherm and Sasobit mixes. Payne & Dolan crews here use the Evotherm mix to pave driving lanes (right) and turn lanes (left) on a section of Highway 100 in the Milwaukee area. Photo: Asphalt Innovations/ MeadWestvaco

WMA mechanics and methods

In the broadest of terms, the production of WMA depends on creating a binder with lowered viscosity — or modifying the binder to make it work as if its viscosity were lowered. Binders with these properties are able to coat aggregate effectively at reduced temperatures, and these properties are controlled by using a proprietary additive in the binder or as a mix ingredient, by employing a proprietary process that results in foaming the binder — or by using both methods, as does the Low Energy Asphalt (LEA) concept.

At present, three proprietary additives for producing WMA are marketed in the United States: Sasobit, Aspha-min, and Evotherm. The proprietary processes are LEA and WAM-Foam (WAM for Warm Asphalt Mix).

To give you a quick overview of the proprietary additives, Sasobit is a product of Sasol, an international company with a North American operation — Sasol Wax Americas — in Shelton, Conn. According to Matthew Corrigan, with the Federal Highway Administration's Office of Pavement Technology, Sasol describes its product as an "asphalt flow improver."

Sasobit, says Corrigan, is a synthetic wax produced from coal gasification, a process that treats white-hot hard coal or coke with steam to produce a gas, which is then exposed to catalysts to create such liquid products as synthetic gasoline and the paraffin wax used in Sasobit. According to Sasol, Sasobit melts at about 210F and "significantly reduces the viscosity of the base bitumen."

The proprietary product, Aspha-min, a granular additive combined into the mix, was developed by Eurovia and the MHI Group (the consolidated subsidiaries of Mitsubishi Heavy Industries). The product is a synthetic "zeolite," a crystal-like material with a "micro-porous" structure (many connected chambers) that can hold as much as 20 percent of the crystal's weight in water.

When Aspha-min is added to the mix and exposed to the heat of the injected binder, says the manufacturer, the water in the granules is "liberated in the form of a finely dispersed water vapor," causing the binder to foam, increasing its volume, and "keeping the asphalt mixture supple and workable even at low temperatures."

Evotherm, a product manufactured by Asphalt Innovations (a MeadWestvaco business in Charleston, S.C.), is a chemical package added to an emulsified binder. According to the company's business development manager, Jonathan MacIver, Evotherm uses a variety of chemistries to target five critical performance properties — mixing, coating, workability, compaction and adhesion.

The emulsion, says MacIver, is an effective means of homogeneously delivering the chemistry, which is present not only in the water, but also imbedded in each asphalt droplet.

Surfactants in the Evotherm package, for example, are designed to modify surface tension at the interface of the asphalt binder and the aggregate, promoting effective coating at a lower temperature. And the same chemistry that helps asphalt stick to rock, says MacIver, also helps it adhere to rock in the presence of moisture. In addition, the Evotherm chemistry also contributes to the binder's lubricity, he says, facilitating workability and compaction.

(According to MacIver, a modified Evo-

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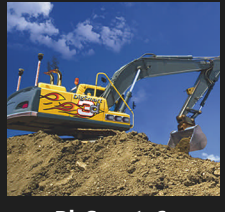
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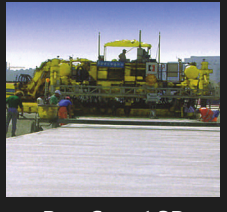
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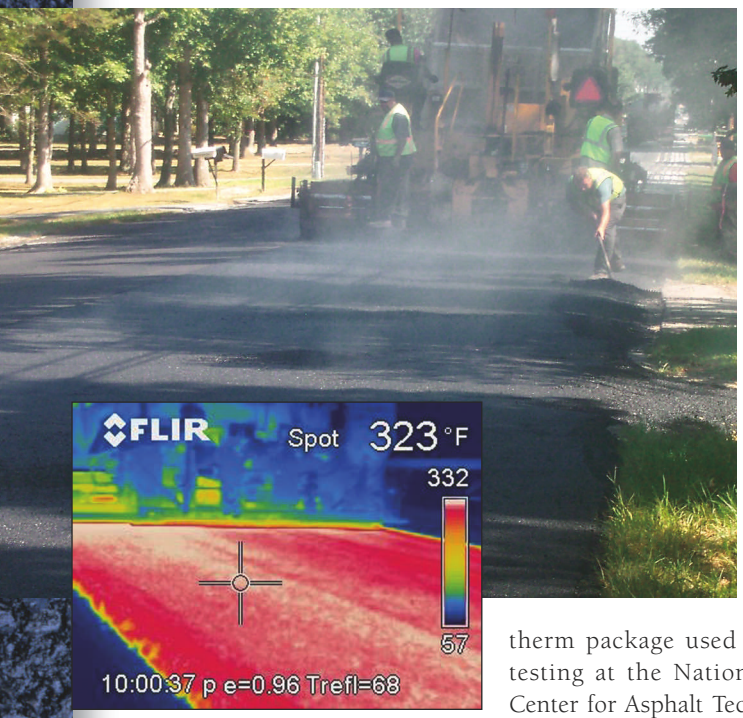



These side-by-side photos were taken on a WMA project using Sasobit in an experimental high-RAP (Recycled Asphalt Pavement) mix. The cooler placement temperature of the Sasobit mix, right, is evident from the absence of vapor coming off the mat, compared with a control section, left, which was paved with conventional hot-mix asphalt. Thermal-photography images, insets, show spot temperatures of 323F for the conventional mix, and 262F for the Sasobit mix.
Photos: Larry Michael, LLM Asphalt Technology Consulting

therm package used in testing at the National Center for Asphalt Technology resulted in a mix with a TSR — tensile strength ratio — higher than 100 percent. This indicates, he says, that the mix actually had a higher strength when wet than when dry.)

Among the process methods for producing WMA is the LEA approach, which was developed by the French company Fairco. We're assuming that LEA is a proprietary process, since Fairco filed for French, European and international patents in 2003, and because the process does employ a proprietary binder additive. We're also assuming proprietary status for the WAM-Foam process, which is not yet marketed in the United States, but might be soon.

In the LEA process, only the coarse aggregate is dried (reaching a temperature of around 300F), and it is then mixed with hot binder, which has been treated with Fairco additives. When mixing is complete, the smaller aggregate and sand are added at ambient temperature and without being dried.

The moisture contained in the small aggregate, says Fairco, initiates a complex reaction that results in binder foaming and expansion, encapsulation of small aggregate particles by the foamed binder, heating of the small aggregate and "recondensation of excess water, which is uniformly distributed in the mix." This reaction is enhanced by means of the additives in the binder, says Fairco, and results in producing mixes at temperatures lower than 100C (212F). Subsequently placing these mixes, according to the company, can be accomplished at temperatures from 140F to 195F.

The WAM-Foam process is a joint venture between Shell International Petroleum and Koko Veidekke, Norway's largest asphalt-mix producer. According to the FHWA's Corrigan, two separate binder components are used in the WAM-Foam process, a "soft" and a "hard." The lower-viscosity soft binder is mixed first with the aggregate at a temperature of approximately 230F.

Then, as the heated hard binder is being added, it is injected with steam, causing it to foam as it mixes with the pre-coated aggregate. According to Corrigan, Shell states that the WAM-Foam process depends on careful selection of the hard and soft binders, and that in some instances, the company recommends the addition of an adhesion improver in the first mixing stage.

Investigating performance

Brian Prowell, assistant director for the National Center for Asphalt Technology (NCAT), and NCAT research engineer, Graham Hurley, conducted evaluations of Aspha-min,

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Sasobit and Evotherm. Their procedures and conclusions are published in NCAT reports 05-04, 05-06 and 06-02, respectively. NCAT worked with NAPA, FHWA and manufacturers of the WMA additives during the evaluations.

According to Prowell and Hurley, the objective of the study was "to determine the applicability of these processes to typical paving operations and environmental conditions commonly found in the United States, including the performance of the mixes in quick-traffic-turn-over situations and high-temperature conditions."

According to the researchers, the use of these three products provided a generally positive affect on the mix. In a summary statement, they note that mixes produced with the additives exhibited an overall reduction in air voids and in improved compaction, and that Superpave-gyratory-compactor results indicated that using these products may lower the optimum asphalt content of the mix.

Using the products, say Prowell and Hurley, also did not affect the resilient modulus of the mix. Nor did these additives increase rutting potential (as measured by the Asphalt Pavement Analyzer — a laboratory tester that assesses, among other factors, a pavement's permanent deformation). Rutting potential did increase with decreasing mixing and compacting temperatures, say the reports, "which may be related to the decreased aging of the binder." Testing also indicated that traffic-turnover time for WMA was about the same for conventional hot mixes.

One concern the researchers did raise, however, was that of potential for moisture damage. According to the reports, this potential downside of WMA could result from lower mixing temperatures not completely drying the aggregate, causing water to be trapped in the coated stone. Experimentation with various anti-stripping agents, however, seemed to mitigate the problem.

At present, says Prowell, NCAT is studying field-test sections around the country, including Evotherm sections placed at the NCAT Test Track. So far, he says, performance has been good, and rutting and moisture damage have not been problems to date.

"We don't want to backslide on today's pavement quality when accommodating new technology."

— Matt Corrigan, FHWA

WMA outlook

Even though the initial work by Prowell and Hurley indicate that Aspha-min, Sasobit and Evotherm "appear as viable tools for reducing mix and compaction temperatures," the asphalt-paving industry is moving cautiously as it learns more about WMA — its processes and its real-world performance.

Unanswered at this point, for example, are questions about the economics involved. Will potential fuel savings, for instance, justify the possibly higher cost of WMA — for additives or for plant modifications that might be required? We asked FHWA's Corrigan to sum up what he sees as the future for WMA:

"A powerful driver for the industry to develop warm-mix-asphalt technology is the concern for emissions. But we want to make sure that this concern — as well as the prospect of other benefits — is balanced with a concern for quality materials and best practices. Pavements have to last, and we don't want to backslide on today's pavement quality when accommodating new technology."

We asked NAPA's Newcomb the same question:

"Warm-mix asphalt is a tool in the tool box, but it's not yet ready for prime-time. The technology will prove very useful if environmental regulations become tighter in defining limits for greenhouse gases. In ozone-non-attainment areas, for example, warm mix may be a way for plants to operate longer on a daily basis. Warm mix also could allow contractors to extend their paving season, or to haul greater distances from plants.

"Although reducing temperature offers a way of reducing energy consumption, the technologies do not currently save enough on these costs to justify the added expense of warm mix. Greater energy savings may be realized when aggregate used in the warm mix is in as dry a state as possible before introduction into the plant."

If you're an asphalt-paving contractor or a mix producer, stay tuned.

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By WALT MOORE, Senior Editor

Working to Make Concrete Pavements Good Neighbors

An army of researchers is investigating ways to make concrete pavements quieter — at the very point where rubber meets the road

If you're going to have an international conference about noise, what better place for a little peace and quiet to do so than Honolulu, Hawaii? Honolulu was the venue for this past December's 35th International Congress and Exposition on Noise Control Engineering, INTER-NOISE 2006. With the theme, "Engineering a Quieter World," the conference addressed all sorts of noise-related issues, from helicopters, to acoustical comfort in buildings, to the effects of loud music.

Of particular interest to pavement experts attending INTER-NOISE 2006, however, were the 19 technical papers (presented by researchers from 11 countries) that focused on various aspects of a common global concern: "Tire Noise and Quiet Pavements."

When we recently asked the American Concrete Pavement Association for its list of top industry concerns, "tire/pavement noise and surface characteristics" was second only to "traffic congestion." The importance of the issue is understandable, because as population increases in proximity to high-volume, high-speed roadways, or, as these types of roadways are built through populated areas, the problem of traffic noise becomes ever more severe.

While traffic noise includes that from engines, engine exhausts, drive trains and vehicle aerodynamics, studies detailed in the Tyre/Road Noise Reference Book, authored in 2002 by Ulf Sandberg (Swedish National Road and Transport Institute) and Jerzy Ejsmont (Technical University of Gdansk, Poland) indicate that the tire/pavement interface is a predominant contributor to the overall noise problem at highway speeds.

At present, diverse research efforts are directed toward the issue (as evidenced at the INTER-NOISE 2006 conference), and prominent among these efforts is an ambitious, seven-year, multi-phase project — the Concrete Pavement Surface Characteristics Program (CPSCP). Taking the lead in this project is a coalition of organizations with a stake in the concrete-paving industry, including the National Concrete Pavement Technology Center at Iowa State University, the Federal Highway Administration and the American Concrete Pavement Association.

Other organizations also are lending their expertise, including the International Grinding and Grooving Association, Iowa Highway Research Board and The Institute for Safe, Quiet and Durable Highways. The latter organization is a joint venture of the schools of civil and me-





Above: Exposed aggregate pavement, such as this roadway in a Belgium roundabout, results from placing a thin lift of concrete — containing small, premium aggregate — over the still-wet surface of a thicker conventional lift, then brushing or spraying the surface with water to partially expose the aggregate before curing occurs. This technique is being investigated as a potential means for mitigating tire/pavement noise on U.S. highways.
Photo: The Transtec Group

The Tire/Pavement Test Apparatus (TPTA) at Purdue University is a 38,000-pound, 12-foot-diameter machine that can be fitted with pavement sections of different materials and textures (and with different types of tires) to evaluate pavement/tire interaction, including noise-generation at the contact patch.
Photo: The Institute for Safe, Quiet and Durable Highways

chanical engineering at Purdue University and the Pennsylvania Transportation Institute at Pennsylvania State University.

The broad objective of the CPSCP is to optimize concrete pavement surface characteristics that address noise, without compromising smoothness, friction and other functional elements of the pavement, says Robert Rasmussen, PhD, P.E., who serves as the project's principal engineer.

"The overall surface-characteristics issue is extremely complex, since noise is closely tied to smoothness, friction, splash-and-spray and other pavement-structure and materials properties," says Rasmussen, whose day job is vice president/chief engineer for The Transtec Group, an engineering and research firm (based in Austin, Texas) that specializes in pavement issues.

The time, effort and resources being poured into quiet-pavement research by the concrete-paving industry are directed toward the practical goal of refining the way concrete pavements are designed, placed and finished.

"As we are now entering the third part of the [CPSCP] study," says Rasmussen, "the focus will be turned heavily to developing practical guidance for both the owner-agencies and contractors about how to build quieter concrete pavements that are also safe and smooth."

The mechanics of noise

We were introduced to the mechanics of noise generation at the tire/pavement interface

through a technical paper published in 2005, "An Introduction to Tire/Pavement Noise," authored principally by Robert Bernhard, PhD, P.E., and Roger Wayson, PhD, P.E. (Bernhard is associate vice president for research/professor of mechanical engineering at Purdue University and director of the Institute for Safe, Quiet and Durable Highways; Wayson is professor of civil and environmental engineering at the University of Central Florida.) The paper included a summary of tire/pavement interaction based on the findings of Sandberg and Ejsmont.

According to Sandberg and Ejsmont, generation of sound at the tire/pavement interface (or contact patch) results principally from four phenomena: tread vibration, air pumping, slip-stick, and stick-snap.



When tining is used to texture the surface, tire noise and friction in the finished pavement can be influenced by the spacing, depth, width, and orientation of the resulting grooves. This GOMACO texture/cure machine is equipped with a skewed tining system, which allows the tining bars to travel in a skewed path, while the frame of the machine remains square to the slab.
Photo: GOMACO

Tread, or tire-carcass, vibration results as the tread blocks of the rotating tire strike the pavement at an oblique angle. The second phenomenon, air pumping, results from the rotating tire forcing air from the front of the contact patch, compressing the air within the tread grooves, and then pulling in air at the rear of the contact patch. This process creates an "aerodynamically generated sound" similar "to the sound created by clapping hands."

The slip-stick phenomenon results as the tread block transfers acceleration and braking forces to the pavement, generating horizontal forces that may cause the tread block to slip momentarily (if the limit of friction is exceeded). The slip is arrested when the tread block subsequently sticks again to the pavement. These rapid slip-stick events generate both noise and vibration, similar to "athletic shoes squeaking on a playing floor."

The stick-snap phenomenon occurs at the rear of the contact patch when the rotating tire pulls the tread block away from the pavement. Breaking the tread block's adhesion to the pavement ("like removing a suction cup") generates sound and vibration.

In addition, say Sandberg and Ejsmont, other forces are at work to enhance, or "radiate," the sound generated by these tire/pavement interface phenomena. Among them is the geometry formed by the tire and pavement (just above the ends of the contact patch) that creates a "horn" for amplifying sound emanating from these areas. Also contributing to radiated sound are the distorted tread passages in the contact patch, which "take on shapes of acoustical systems that enhance sound generation" in a fashion similar to that of a pipe organ or to that of blowing across the top of an open bottle (the latter known as Helmholtz resonance).

Measuring the sound generated as high-speed traffic passes over the pavement is among the researcher's fundamental challenges, and a number of methods are employed. The "statistical pass-by" method, for instance, measures the sound of a random mix of vehicles, one at a time, with a roadside microphone. The "controlled pass-by" method is essentially the same, except that only a few select vehicles are used and are driven by at controlled speeds. These methods measure all sources of highway sound, while "close-proximity" methods use microphones or "intensity probes" located near the contact patch to more specifically measure either the pressure or intensity of sound in that area.

Pavement-texture basics

While the design of a specific tire may have an effect on the characteristics of the sound (or noise) generated as a vehicle travels at high speed across a concrete roadway, it's probably safe to say that pavement texture is

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the primary determinant of sound generation.

Pavement texture (or surface-profile characteristics) is classified into four "ranges," according to information we first reviewed in the report, "Evaluation of U.S. and European Concrete Pavement Noise Reduction Methods." (This CPSCP report is published by the National Concrete Pavement Technology Center.)

These surface-texture classifications — micro-texture, macro-texture, mega-texture and roughness — are based on the "spacing between the crests of sequential (repeating) surface features." According to the report, "roughness" features have repeating crests of 20 inches or more (faulted transverse joints, for example), while "mega-texture" features repeat themselves every 2 to 20 inches (transverse cracks, perhaps). These surface characteristics, says the report, typically result from poor construction, surface deterioration or settlement, and they have minimal effect on noise generation.



This on-board-sound-intensity-measurement system takes readings in the airflow (parallel with the vehicle) at the front and rear of the tire's contact patch. Photo: The Transtec Group



RoboTex, a robotic texture-measuring system developed by The Transtec Group, projects a laser line approximately 4 inches wide, thus generating a detailed, three-dimensional texture map. Photo: The Transtec Group

"Macro-texture" features have repeating crests that occur in a pattern of 0.02 to 2.0 inches, "a pattern that may be created by grooving, indenting or otherwise forming small channels in the pavement surface." According to the report, which in turn cites other sources, macro-texture is important, "because it is not only a primary contributor to pavement noise, but also a factor in many other pavement-surface characteristics, including friction and splash-and-spray."

The report states that "micro-texture" consists of surface irregularities typically spaced at less than 0.02 inches apart, and not readily visible to the naked eye. Micro-texture features include textures created by fine sands and the surface roughness of exposed aggregate particles. Micro-texture likely has more effect on a pavement's frictional characteristics than on its noise-generation characteristics.

Evaluating textures

Measuring pavement texture, with an eye toward coordinating results with noise-generation potential and other characteristics, is a complex process. The CPSCP is addressing the issue and has, among other research efforts, developed a robotic texture-measuring system (RoboTex). The CPSCP, so far, has evaluated more than 1,000 pavement surfaces, says Rasmussen, with the objective of "measuring and analyzing conventional texturing variations and grinding techniques…particularly with respect to tire/pavement noise."

Among the conventional texturing methods the CPSCP is investigating are the drag textures (artificial-turf and burlap) and tined textures (transverse, skewed and longitudinal). You can read preliminary conclusions about

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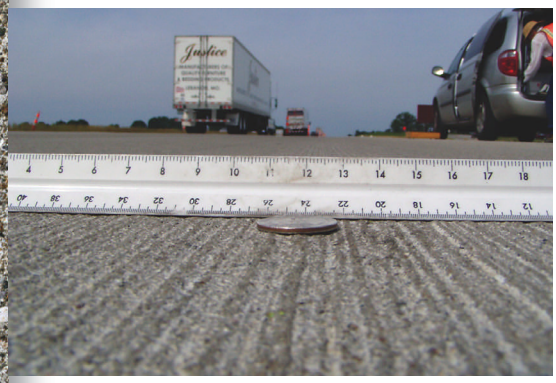
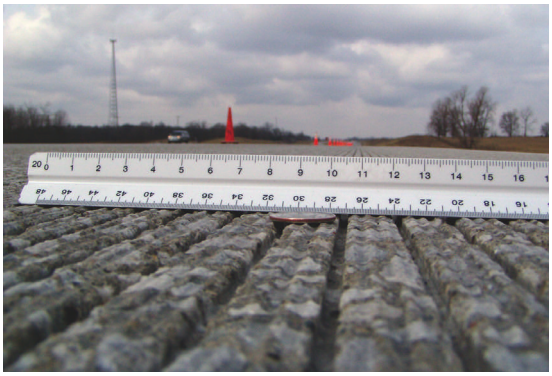
how these "macro-texturing" methods affect pavement performance and noise by bringing up an online copy of "Evaluation of U.S. and European Concrete Pavement Noise Reduction Methods."

Also being analyzed is the diamond grinding technique, which uses closely spaced diamond saw blades on a common shaft to produce 50 or 60 grooves per foot. The CPSCP report cites research that indicates the technique can reduce tire/pavement noise and restore pavement friction.





The pavement on the left was finished by the artificial-turf-drag method, and the pavement on the right has been both diamond ground and grooved.
Photo: The Transtec Group

Interesting to note is the report's observation that, although diamond grinding has been used primarily for existing-pavement rehabilitation, its noise-reducing potential "raises the possibility of using the technique as an initial texturing method for newly placed concrete pavements." According to the report, the grinding procedure results in a beneficial macro-texture and, in some instances, enhances micro-texture. But, that said, other researchers caution that economic considerations for extensive diamond grinding still must be evaluated.

Looking ahead

Among the possibilities that the CPSCP is investigating for creating quieter macro-textures are techniques such as "dimpling or waffling" fresh concrete — processes that will provide more desirable surface characteristics than conventional tining, but at about the same cost. One idea is to machine a "corduroy-like" macro-texturing pattern into the slipform paver's profile pan. Other ideas include sprinkling and partially embedding small stone chips into the fresh-concrete surface, as well as shotpeening cured surfaces.

Future pavement designs, says the report, may specify concrete with inclusions of fiberglass, foam or rubber particles to "increase acoustical absorption." Or, acoustically absorptive material may be used in pavement shoulders (not driving lanes) to intercept noise before it reaches human ears.

Two other pavement-design ideas with noise-reducing potential also are advanced in the report: exposed aggregate pavement and pervious or porous pavement. The former is routinely used in Europe to mitigate roadway noise, and the technique essentially involves placing a thin lift of concrete — containing small, premium aggregate — over the still-wet surface of a thicker conventional lift, then brushing or spraying the surface with water to partially expose the aggregate before curing occurs.

While pervious or porous concrete is starting to be used to control water run-off from surfaces such as parking lots and low-volume access roads, its use for high-volume, high-speed roadways is still experimental. That said, however, the technique is gaining considerable attention, because of its acoustical absorption potential.

Professors Bernhard and Wayson state in their "An Introduction to Tire/Pavement Noise" that porosity levels of 18 to 25 percent in these pavements assist in reducing noise by diminishing the effect both of air pumping and of the noise-enhancement phenomena.

To come full circle, back to INTER-NOISE 2006, a team of Japanese researchers there presented a paper about techniques for diagnosing a porous pavement's health, that is, for determining if mud, sand and tire-rubber debris collecting in the pavement's sound-absorbing air gaps have diminished its ability to attenuate noise at the contact patch.

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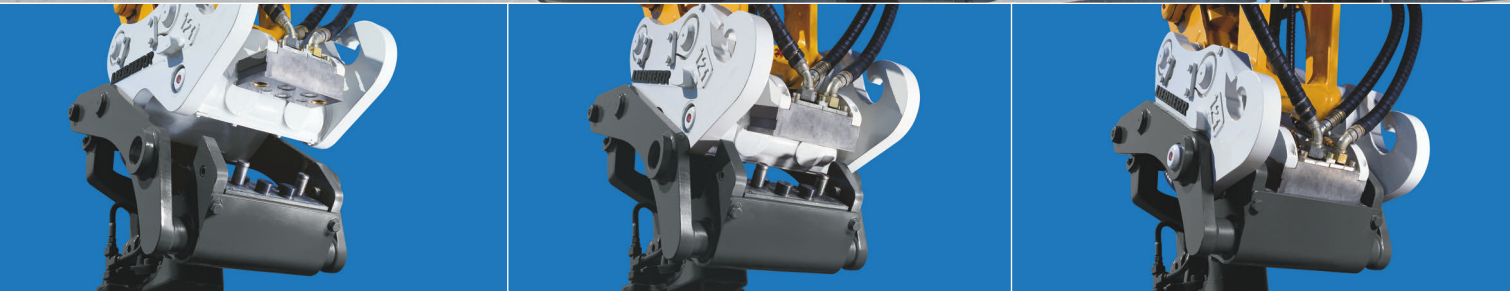

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By WALT MOORE, Senior Editor

You Sure This Is a Skid-Steer?

Gehl's 7810E has the capacity to handle big buckets and serious attachments, yet maintains skid-steer nimbleness



The EDGE power rake uses dual hydraulic motors to drive the drum.

When Gehl delivered a new 7810E skid-steer loader to the Apprenticeship and Skill Improvement facility that Local 150 (International Union of Operating Engineers) maintains in Plainfield, Ill., we weren't surprised to hear the Local 150 instructor crew call it names. But in this instance, "horse," "beast" and "grizzly bear" were compliments.

Based on the machine's rated operating capacity of 3,850 pounds, the 7810E is the largest skid-steer around (except, of course, for its twin in the Mustang line, the model 2109). We thought this size distinction made the machine an interesting candidate for a Hands-On-Earthmoving evaluation.

Gehl's Kelly Moore, product manager for skid-steer and compact track loaders, and Lori Heidecker, marketing services manager, arranged the loan of the 7810E. The machine arrived nicely equipped — with joystick controls, HydraGlide ride-control system (standard with the joysticks), two-speed-travel system, Titan H/E severe-duty tires, and an electrically actuated Power-A-Tach coupler.

About the only option the 7810E didn't have was high-flow hydraulics (rated at 41 gpm). But with a standard auxiliary flow of up to 29 gpm, the machine had more than enough hydraulic horsepower to handle the work tools

that accompanied it. The 7810E arrived with a 90-inch power rake, an 84-inch vibratory roller, an 8-foot dozer blade (with powered angle and tilt functions) and its big 1-cubic-yard bucket. All these tools were EDGE brand products supplied by CEAttachments, and CE-Attachments' sales supervisor, Ron Peters, was on site to help with installation.

E-version refinement

Our introduction to Gehl's 7000-Series models actually goes back to late 2001, when *CE* conducted a field comparison between the then-new 7800 (with a rated operating capacity of 3,600 pounds) and the 6635DXT, which, with a standard rated operating capacity of 2,350 pounds, had previously been the largest model in the Gehl line. The big jump in capacity, explained Moore at the time, was to meet the demand of customers who needed a larger machine for handling taller trucks and heavier attachments.

In the intervening years, says Moore, the big machine's market acceptance has exceeded Gehl's expectations.

"It's a powerful machine," says Moore, "and when properly applied, it excels in a variety of applications. We also consider it a viable replacement for certain compact wheel loaders, especially if maneuverability, cycle speed and attachment performance are important. And, it's considerably less expensive than wheel loaders having similar horsepower, capacity and lift height."

The recently introduced 7810E, compared with its 7800 predecessor, has gained some weight, now tipping the scale at 10,520 pounds. The weight gain, resulting principally from frame changes and from structural changes in the lift arm, gives the new model 250 pounds more rated operating capacity and significantly more bucket breakout force — now rated at 8,340 pounds.

The engine also has been changed. But in a bit of a turnaround from the typical practice of increasing power in new models, the 7810E actually has 15 less horsepower than its predecessor. The new 99-hp Cummins B4.5T-99C, however, has nearly 5 percent more torque (305 pounds-feet) than the previously used Perkins and, according to Moore, you won't notice any performance differences — and might see a modest improvement in fuel economy. Customers were asking for Cummins power, says Moore, and the chosen engine allowed the 7810E to delay Tier-3 emissions regulations and the related design complexity that compliance would have entailed (such as charge-air cooling).

Retained from the predecessor model, though, is a long list of features, including the 55-inch wheelbase, lift height of 142 inches (at the bucket hinge pin), vertical-path PowerView lift arm, large Rexroth servo transmission, and radial-piston drive motors.



The 84-inch EDGE vibratory roller proved a serious attachment for the 7810E.

Opinions from the shop

The first stop for the 7810E was the Local 150 shop, where Moore, Heidecker and Peters reviewed the features of the machine and its work tools for the Local's technical staff. Basically, all agreed that the 7810E was an impressive machine, but since not much in the way of design detail gets past this experienced crew, they had a few observations.

For example, after seeing the heavyweight attachments that the 7810E was to use, Rick Bewsey questioned the capability of the machine's universal-style coupler, wondering if it had the mass and strength to handle these large

tools. Moore assured him that the coupler had been sized appropriately, and that both testing and field use on the 7810E's predecessor had proved it capable of accommodating any approved attachment.

Dale Brown made an observation about the 7810E's fuel filler. The machine's light-colored, polyethylene fuel tank has an extended-neck filler tube that's sealed with a black cap. The filler tube is adjacent to the radiator, and is identified only by a small decal on the inside of the frame.



Local 150's technical crew (from the left, Rick Bewsey, Dale Brown, Tom Barone and Sean Connelly) gave the 7810E a detailed look. Gehl's Kelly Moore (hand on the lift arm) and CE-Attachments' Ron Peters await the verdict.

"The fuel-tank filler should be more clearly identified — with a conventional green cap and with unmistakable identification on the tank," said Brown. "Our perspective as trainers is dealing with inexperienced operators and technicians, and if they see a filler tube next to a radiator, like this one, then it may get antifreeze and not fuel. Believe me, we've lived through this."

(NOTE: Gehl changed to a green cap with mid-October production.)

Tom Barone suggested that the hydraulic filler tube, located near the top of the engine, be raised to avoid spilling when replenishing fluid. He also questioned the location and accessibility of the batteries, which are in a compartment beneath the operator's feet. Moore explained that an exterior panel allows access to the batteries, and that remote terminals at the rear of the machine can be used for jump-starting or to power electrical accessories, such as a refueling pump.

Tom Rush, our operator for the day, suggested the electrical cable, which powers the coupler, could be better protected.

"Good suggestion," said Moore, "but we've beaten you to it — it's already in engineering."

This crew, however, is equally ready to point out what they see as positive design elements. Bewsey thought that the absence of a computer and the use of a mechanical fuel system made for a sensible design in a skid-steer.

"I'm not anti-technology," he said, "but if you don't need electronics, then don't use them. Sometimes this electronic stuff is just bells and whistles that add cost and complexity."

And Brown, who spends his share of time bending wrenches, was pleased to see that the 7810E's chain-case covers provided generous openings for service. "That's a sore point on some skid-steers," he said.

Bewsey essentially summed up the group's consensus: "It's a horse; I'm impressed."

Out into the real world

Having had a close look at the 7810E in the shop, operator Tom Rush was interested in getting the machine into the dirt. His first experiment was to dig from a firmly compacted stockpile of wet soil, maneuver a bit with the loaded bucket, then dump from full height.

"The machine's capacity is incredible," said Rush. "This is really heavy stuff, and it had no problem breaking it out and lifting it. I've seen the back end of some small wheel loaders come up working in this material. I'm also impressed that the machine is so stable with such a large bucket. Just as a little test, I got the bucket as full as I could, raised it and shook it a bit. But the machine didn't flinch."

Rush was able to add a real-world aspect to the load-and-dump exercise when we flagged down Local 150's newest tandem-axle dump truck, measuring 9 feet to the top of the sideboard. After making a few passes, Rush was again complimentary about the machine's capabilities.

"The machine's lift height is great. The boom seemed to keep going up and up. I could almost dump in the center of the truck. I could see a concrete contractor using it for lifting forms onto a truck with a set of forks — and for moving a lot of stone for base or backfill."

Rush next used the dozer blade, which, as noted, was 8 feet wide with hydraulic angle (30 degrees) and hydraulic tilt (10 degrees) — right and left for both functions. The blade was 24 inches tall, weighed slightly more than 1,500 pounds, and was, as technician Rick Bewsey observed, "a very stout piece of hardware."

According to CEAttachments' Ron Peters,

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Even with its tires packed with mud and pushing heavy, wet material, the 7810E had the weight and power to move some hefty loads.



The 7810E had no problem getting up and over the 9-foot sideboards of this tandem-axle dump. Operator Tom Rush was impressed with both the machine's lift height and its digging ability.

the blade is primarily designed for leveling, grading and piling loose material. But since it had rained the night before, wet, heavy soil was about all Rush had to push. The 7810E's severe-duty tires, Moore told us, really weren't the optimum choice for working in mud, because they don't throw off sticky material as well as conventional HD lug-style tires. Dozing in the wet soil, he said, would have been easier with over-tire tracks. But, that said, Rush thought the 7810E did an acceptable job.

"The blade worked better in the mud than I would have thought, and even though the tires were packing, the machine still pushed aggressively at slow speeds. If you were grading on hard ground, the machine's long wheelbase would be valuable, because it lets you actually feel the dips and rises a little better. The only criticism I have is that it's difficult to see the corners of the blade when it's angled, so it's difficult to keep the windrow going — and I had a problem with depth control."

Moore explained to us that the blade works best when the machine's boom arm is firmly against its stops, allowing a solid connection through the coupler to the blade. So, instead of using the boom arm to control blade height, he suggested using the loader mechanism's tilt function, which works well, he said, when the operator becomes familiar with it.

Rush was again complimentary about the machine's performance with the power rake, which he used in relatively dry material uncovered in the dozing exercise. The rake employs dual hydraulic motors to drive the carbide-toothed drum, which angles 20 degrees in each direction to allow windrowing rock. With its end plates installed, the attachment becomes a powered box-rake.

"You could almost use this as a profiler," said Rush. "The stuff I was working in sometimes has to be ripped with a grader to get it loose. But you could make four or five passes with the rake and chew it up pretty good."

In a final exercise with the 7810E, Rush ran the 84-inch, 2,300-pound EDGE vibratory roller over the material just loosened with the rake. The drum's maximum exciter speed is 3,000 rpm, and the vibratory system can work with a wide range of flows (10 to 50 gpm) and pressures (1,500 to 3,000 psi).

"The roller and the big machine make an impressive package," said Rush. "It would be ideal for, say, parking lots, where a contractor might not be able to efficiently use a larger compactor."

When we asked Rush for any final thoughts, the 7810E's overall power was obviously his lasting impression:

"It's like a grizzly bear; I've never seen a skid-steer this strong." CE

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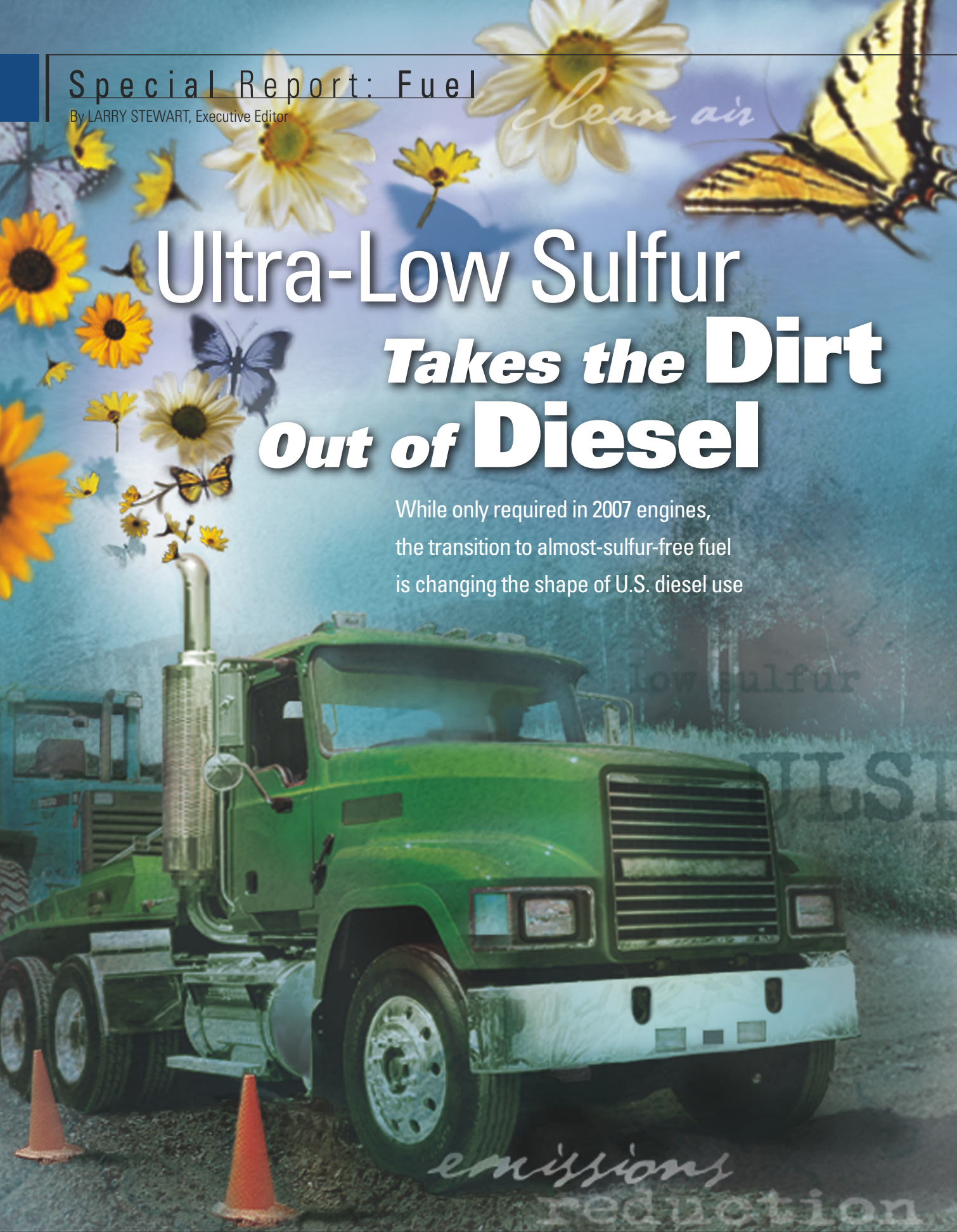
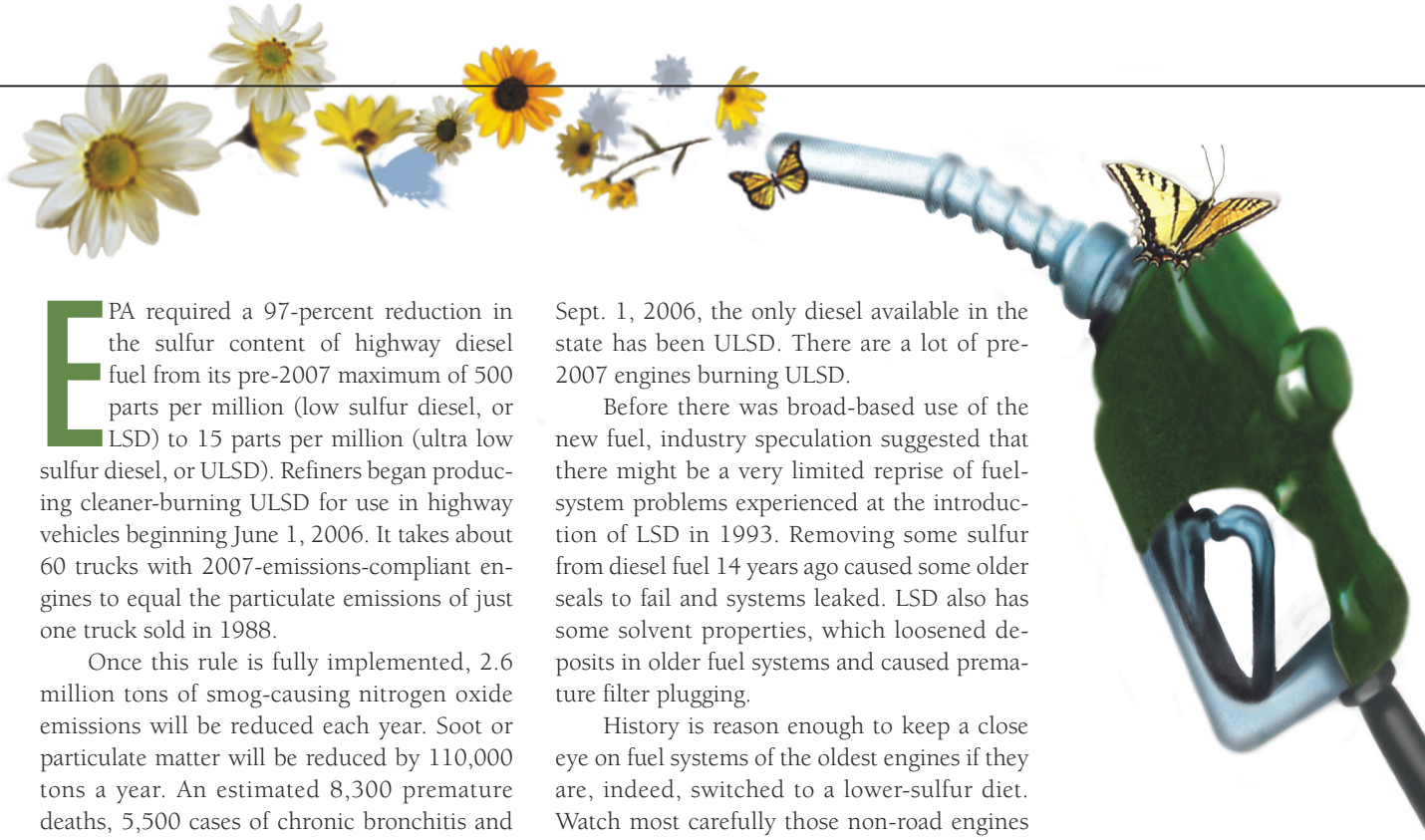
By LARRY STEWART, Executive Editor

Ultra-Low Sulfur Takes the Dirt Out of Diesel

While only required in 2007 engines, the transition to almost-sulfur-free fuel is changing the shape of U.S. diesel use





EPA required a 97-percent reduction in the sulfur content of highway diesel fuel from its pre-2007 maximum of 500 parts per million (low sulfur diesel, or LSD) to 15 parts per million (ultra low sulfur diesel, or ULSD). Refiners began producing cleaner-burning ULSD for use in highway vehicles beginning June 1, 2006. It takes about 60 trucks with 2007-emissions-compliant engines to equal the particulate emissions of just one truck sold in 1988.

Once this rule is fully implemented, 2.6 million tons of smog-causing nitrogen oxide emissions will be reduced each year. Soot or particulate matter will be reduced by 110,000 tons a year. An estimated 8,300 premature deaths, 5,500 cases of chronic bronchitis and 17,600 cases of acute bronchitis in children will also be prevented annually.

By 2010, most diesel engines will have to burn ULSD. But for now, clean-air rules only require use of the clean diesel in engines manufactured for the 2007 model year and after. The rule also requires 80 percent of diesel produced in the United States be ULSD, though, so it is changing the way diesel fuel is burned in today's vehicles — from Class 8 trucks to pickup trucks, and from scrapers to SUVs.

The fuel change is necessary for 2007 on-road diesels to meet the Environmental Protection Agency's (EPA's) 2007 emissions limits. Exhaust aftertreatment devices — particulate filters and NOx catalysts plumbed into the exhaust line — were designed to work with ULSD. Operating without the clean fuel, these expensive devices are quickly ruined, engine reliability and fuel economy will suffer, and the engine warranty will be voided. Anyone responsible for fueling a 2007 model year engine with diesel that has more than 15 ppm sulfur is subject to civil prosecution and fines.

The previous on-road fuel, LSD with sulfur content up to 500 ppm, won't be gone completely for several years. Diesel engines from the '06 model year and earlier and what EPA calls non-road diesels — off-road engines in everything except locomotives and boats — may be fueled with LSD until 2010. Locomotive and marine diesels make the transition to ULSD in 2012. California kept it simple. Since Sept. 1, 2006, the only diesel available in the state has been ULSD. There are a lot of pre-2007 engines burning ULSD.

Before there was broad-based use of the new fuel, industry speculation suggested that there might be a very limited reprise of fuel-system problems experienced at the introduction of LSD in 1993. Removing some sulfur from diesel fuel 14 years ago caused some older seals to fail and systems leaked. LSD also has some solvent properties, which loosened deposits in older fuel systems and caused premature filter plugging.

History is reason enough to keep a close eye on fuel systems of the oldest engines if they are, indeed, switched to a lower-sulfur diet. Watch most carefully those non-road engines built before 1993 that had been fueled with non-road fuel containing more than 500 ppm sulfur. Virtually all fuel systems built since 1993 use upgraded seals that aren't as susceptible to fuel changes.

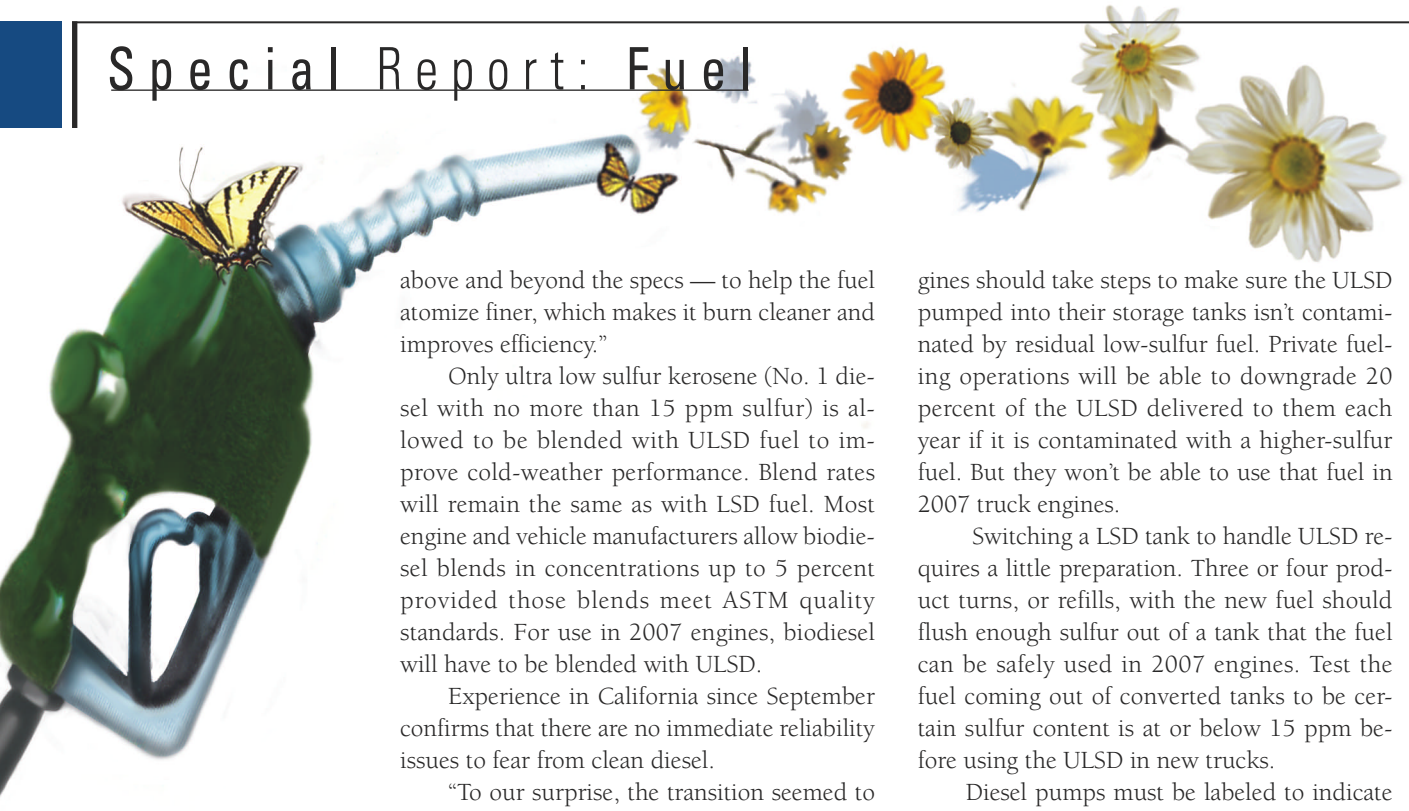
"In the Chicago area, we started using ULSD probably mid-summer last year and we didn't see any issues related to its use," says Joe Fell, fleet manager with Ryan Central, of the Janesville, Wis., contractor's mostly off-road diesel fleet.

For on-road engines, there's plenty of reason to expect a problem-free transition to ULSD. Their seals have been upgraded as non-road fuel systems have. With LSD sulfur limited to 500 ppm, the switch to ULSD at less than 15 ppm sulfur represents a less-dramatic change than in 1993.

Many municipal and transit fleets in regions with serious air-quality issues, such as parts of New York and California, have been operating pre-2007 diesel vehicles for some time on ULSD. Nationwide, major trucking concerns such as Penske and Ryder started testing ULSD well before California's early transition. They reported no reliability problems.

The truckers' razor-sharp focus on fuel costs measured less than a 1-percent fuel-economy decline in '06 or older trucks burning ULSD, even though cleaning up the fuel can reduce its energy content slightly.

"Additive packages are more important in ULSD," says Fell. "They're engineered to go



above and beyond the specs — to help the fuel atomize finer, which makes it burn cleaner and improves efficiency."

Only ultra low sulfur kerosene (No. 1 diesel with no more than 15 ppm sulfur) is allowed to be blended with ULSD fuel to improve cold-weather performance. Blend rates will remain the same as with LSD fuel. Most engine and vehicle manufacturers allow biodiesel blends in concentrations up to 5 percent provided those blends meet ASTM quality standards. For use in 2007 engines, biodiesel will have to be blended with ULSD.

Experience in California since September confirms that there are no immediate reliability issues to fear from clean diesel.

"To our surprise, the transition seemed to have gone almost seamlessly," says Tupper Hull, a spokesman for the Western States Petroleum Assn., which represents the petroleum industry in California, Washington, Oregon, Nevada and Arizona. "We anticipated there might be some fuel leakage and, in fact, Chevron had a bulletin out that identified some potential for fuel-system leaking. But we have not received any significant complaints."

Preserving the extremely low sulfur content of ULSD despite the opportunities for contamination in the distribution channel presents a real challenge to refiners and distributors. Mixing a very small portion of diesel at 500 ppm sulfur will render a bulk tank or pipeline full of ULSD illegal and destructive if used in 2007 truck engines.

Fleets planning to fuel their own 2007 engines should take steps to make sure the ULSD pumped into their storage tanks isn't contaminated by residual low-sulfur fuel. Private fueling operations will be able to downgrade 20 percent of the ULSD delivered to them each year if it is contaminated with a higher-sulfur fuel. But they won't be able to use that fuel in 2007 truck engines.

Switching a LSD tank to handle ULSD requires a little preparation. Three or four product turns, or refills, with the new fuel should flush enough sulfur out of a tank that the fuel can be safely used in 2007 engines. Test the fuel coming out of converted tanks to be certain sulfur content is at or below 15 ppm before using the ULSD in new trucks.

Diesel pumps must be labeled to indicate the type of fuel on tap. Refueling operations are also required to archive product transfer documents for a five-year period. The federal fine for dispensing fuel as ULSD that does not meet the spec is $32,500 per day per incident for a minimum of 25 days.

In regions farthest from refineries, fuel must pass through multiple distribution points and the risk of contamination before it reaches the buyer is highest. For the next few months, users of 2007 on-road diesels in remote places may have to take special care to be sure they can get ULSD. If the price difference between ULSD and low-sulfur diesel grows much beyond 13 cents per gallon, retailers in some pockets of the country may choose to keep only low-sulfur fuel in inventory.

The industry has been expecting ULSD to

Clean-Diesel Phase-In

Pre-1993	1993	2007	2010	2012
Unregulated diesel sulfur	Low sulfur diesel: On-road fuel limited to 500 ppm sulfur	Ultra-low sulfur diesel: 2007 engines require fuel limited to 15 ppm sulfur Non-road engines must burn low-sulfur diesel or ULSD	On-road and non-road diesels must burn ULSD	Locomotives and marine diesels must burn ULSD

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cost about 4 cents per gallon more than LSD, but volatility in the fuel market has made the price difference difficult to identify. As of Jan. 18, national-average retail prices for on-highway diesel had dropped for three consecutive weeks.

When California made the complete transition to ULSD in September, there was no spike in diesel prices, according to data compiled by the Oil Price Information Service (OPIS), a third-party research firm that tracks daily fuel prices. But when gasoline prices dropped last Labor Day and diesel prices remained stable, some observers argued it was because of refiners' prodigious investments to produce ULSD.

It's important to remember that refiners invested billions of dollars to produce ULSD. They're going to make that investment pay. Contract price on a barrel of crude oil on Jan. 12 was $50.12, which was $6.63 per barrel less than the price a year ago. Nevertheless, the retail price per gallon of on-highway diesel fuel was $2.46, which was about 1.5 cents per gallon more than one year ago.

Despite a diesel pump price that's 24 cents per gallon higher than gas, ULSD and aftertreatment technologies appear to be encouraging automakers to develop diesel engines for light trucks, SUVs, vans and cars. About half of European light vehicles sold today are diesel fueled because of the engine's power, durability, and fuel economy — typically 20 to 30 percent more efficient than conventional gasoline engines.

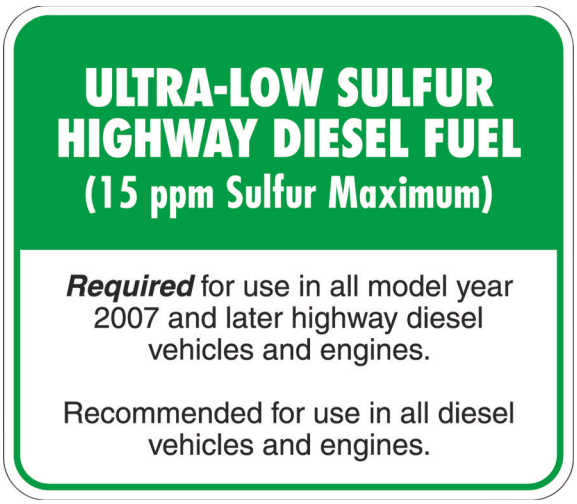
J.D. Power Automotive Forecasting expects the U.S. market for light-duty diesel engines to grow from 3.6 percent in 2006, or about 600,000 vehicles, to about 9 percent in 2013, or 1.66 million vehicles. By 2015, they project diesels will have a 12 percent market share, or 2.2 million vehicles.

Volkswagen and DaimlerChrysler have announced plans to introduce diesel models that will meet emissions standards in all 50 states by 2008. DaimlerChrysler has signed an agreement to buy light-duty diesel engines from Cummins for use in vehicles with GVW of less than 8,500 pounds. Cummins will build the new line of light-duty diesels in its Columbus plant. Production is scheduled to begin by 2010.

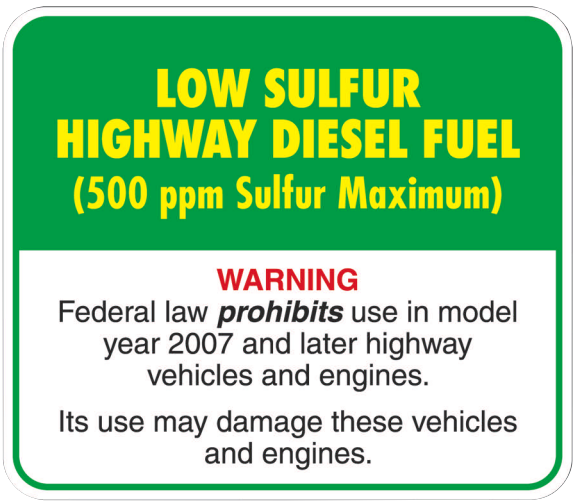
Ford plans to offer a diesel version of its popular F-150 pickup, and General Motors says it will bring diesel to light-duty pickups after 2009. Honda Motor Co. has said it will introduce a diesel vehicle within three years that will meet California's emissions standards.

Two weeks into the national transition to ULSD, it appeared that the rest of the country was enjoying a fuel non-event much like the problem-free California experience. A downside to the switch to ULSD has yet to appear, and use of diesel seems likely to expand significantly.

What's your opinion? Go to the online article at ConstructionEquipment.com and post your comments at Talk Back.



This label must be displayed on pumps that dispense ultra-low sulfur diesel. It is illegal, and damaging to the equipment, to run emissions-compliant 2007 on-road diesel engines fueled by anything other than ULSD.



This label must be on pumps that dispense low sulfur diesel, like that which has fueled on-road diesels since 1993. Pre-2007 on-road engines can still burn this fuel, as can non-road diesels.



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By TOM BERG, Truck Editor

Heavy Hybrid Motors Smartly

Prototype diesel-electric truck for the U.S. Air Force is easy to drive, and it could lead to commercial production in 2009

What's this — a flying dump truck? Sort of. The U.S. Air Force operates thousands of trucks to support the missions of its high-performance aircraft, and the one pictured here is among several with advanced diesel-electric hybrid systems that soon will go on active duty, thanks to work by Volvo Powertrain North America and Mack Trucks.

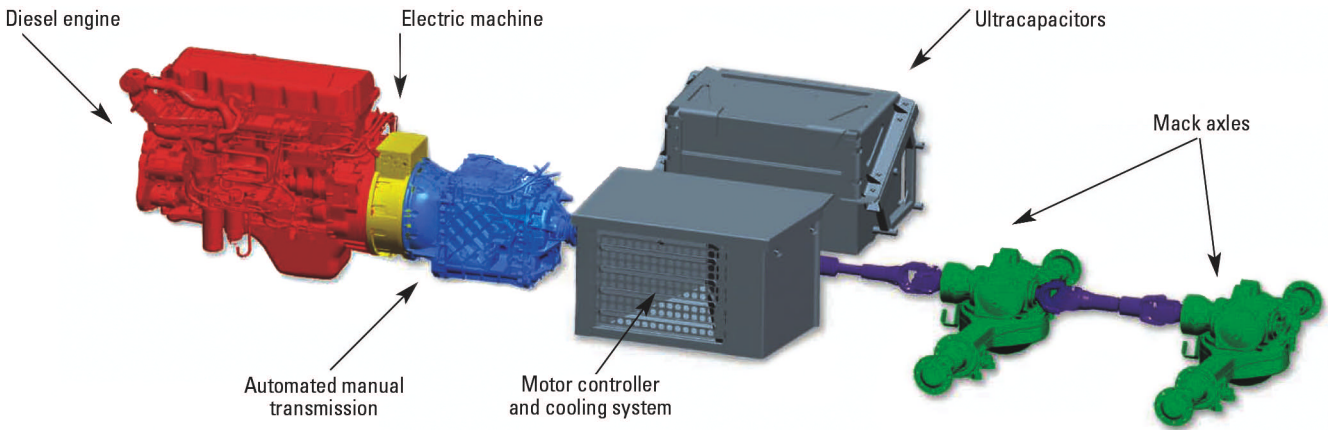
Volvo Group, their Swedish parent, earlier this year hosted a briefing on its hybrid vehicles projects. And Mack, which is building six heavy hybrid trucks for the Air Force, showed off two of them, both Granite dumpers. An RD-based heavy tanker used for refueling aircraft is now undergoing evaluation, while another Granite dump truck and two LE trash-collection trucks are planned.

The briefing and demonstration were in Washington, D.C., to underscore the importance of government participation and funding at this point in development. Contracts worth $6.8 million are paying for this project, which required extensive engineering. Volvo thinks the technology will be mature enough by 2009 for it to offer the systems in commercial trucks, and believes their advantages, such as fuel savings of up to 35 percent, will offset the hybrid components' extra costs.

Hybrid systems' ability to reduce fuel consumption is key to western countries achieving energy independence from oil-rich



Air Force-blue Granite hybrid 10-wheeler looks unremarkable except for its chrome bumper and big chromed box, which houses 270 ultracapacitors to store electricity generated during braking. Another box on the left side houses electronic controls and the radiator for the motor-generator. The truck weighed about 50,000 pounds during the demo.



To an otherwise typical power train, Volvo Powertrain's hybrid system adds an automatic clutch (not shown, but just behind the engine), a liquid-cooled motor-generator (here labeled "electric machine," which also acts as the starter and alternator), and an automated mechanical transmission. Also used are ultracapacitors (high-tech batteries), electronic controls, and a radiator for the motor-generator.

but politically troubled regions, said Leif Johansson, Volvo Group's president and CEO.

Sten-Ake Aronsson, who heads Volvo Powertrain North America at the former Mack engine and gearbox facility in Hagerstown, Md., said the parallel hybrid system uses an 11-liter MP7 diesel, an automatic clutch, a liquid-cooled electric motor that doubles as a generator, an automated mechanical transmission, and highly specialized electronic control systems. The truck starts out using electric energy only, diesel only, or both; but the diesel is needed for much of the acceleration work and for cruising, which is why the system is called "mild." The hybrid parts were installed after the truck came off the assembly line; driveline and tandem rear axles are standard Mack components.

In operation, the motor helps launch the truck from a standstill; then, during braking, becomes a generator to convert the truck's inertia to alternating current. This is inverted to direct current and stored temporarily in a bank of ultracapacitors; when the truck moves out from a stop, the DC electricity is inverted back to AC to spin the motor.



The voltmeter showed charge state of ultracapacitors; voltage varied between 580 and 610, with an aimed-for average of 600.

The truck launches smartly, and the driver hardly knows it's getting an electric boost. That was my impression from behind the wheel during the demo, on part of the parking lot surrounding RFK Stadium. It operated so easily that a GI driver might not be aware of how special a vehicle this is. Then again, it's got a decidedly non-military chromed bumper and two big chromed boxes hung from the frame behind the cab; and the smooth, self-shifting transmission does not behave quite like the Allison automatics common on military trucks.

The transmission is an adaptation of Volvo's new-to-America I-Shift. Mack people like Guy Rini, director of advanced propulsion, call it simply an automated mechanical transmission, partly because Volvo Trucks is a rival, even if it is a sister company. Also, this tranny has some mechanical differences: Its clutch is remotely mounted on the engine, ahead of the motor-generator, and its top gear is a 1:1 direct-drive for vocational use, whereas I-Shift has an overdrive top gear for use in Volvo highway tractors.

There is no clutch pedal because the clutch engages and disengages automatically. All I did is start the engine, release the parking brake, move the shift selector from Neutral to Drive, and step on the accelerator. The truck moved out and the engine began roaring almost immediately, causing me to wonder if the diesel was doing all the work. It would have if the ultracapacitors were discharged, but the voltmeter on the instrument panel varied between 580 and 610, indicating there was a lot of juice available.

The average operating voltage is 600, said



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To a driver, the selector for the automated mechanical transmission, the voltage meter above the speedometer and tachometer, and lack of a clutch pedal hint that this truck is something special. But it'll be a working dump truck on duty at an air base, perhaps Eglin in Florida or Hickam in Hawaii.

Tim Jacobson, a Volvo Powertrain engineer who's been working on this project for several years. The engine began working so soon because the transmission was programmed to start out in 1st or 2nd, he explained. As road speed matches the engine's 700-rpm idling speed in the start-out gear, it revs up and begins assisting. This was at about 3 mph in 2nd.

He showed me how to get the electric motor to do more: Put the selector in Manual and thumb a rocker switch on the selector until the readout on the dash says "6," the new start-out gear. Then step on the accelerator, and the truck moves out on motor alone until it reaches about 6 mph, the road speed it would be moving at 700-rpm idle; at that point, the engine began revving and doing more of the acceleration work.

Pretty soon I preferred this because it's quieter and, of course, we were using more of the stored electric energy. The 160-hp motor is strong, developing as much as 590 lbs.-ft. — one of the things that makes this system so pleasing to drivers, Volvo Group's Johansson had said.

The start-out gear can be programmed to suit the operation, Jacobson said. Now it's set up for a trash-collection truck, whose stops and starts are much more frequent than a dump truck's. These Air Force dumpers will haul dirt, gravel and other materials in support of "civil engineering" activities on Air Force bases, pick up exploded ordnance on bombing ranges, and other utility tasks, said Capt. Jim Muldoon, one of the service's project managers.

The prototype hybrid dump trucks, and the others in the program, will of course save fuel, but more importantly, they'll allow mechanics and operators "to get experience with this technology," he said. Maintenance should be simpler because the motor-generator is also the starter and alternator. The third dump truck will also have electric-driven power steering, air conditioning and other accessories, further reducing parasitic loads on the engine and, everyone hopes, also be more reliable.

Other types of Air Force trucks would have greater use for the power generation aspect of the hybrid system. This service and the Army, which is indirectly involved in the project, has weapons transporters which need 24 steady volts and up to 400 amperes to power their equipment, Muldoon said. Right now separate engine-driven generators supply this power, "but why use a generator when you've got a perfectly good one under the hood?"

Electricity in the hybrid dump trucks is used strictly for propulsion. The diesel powers the hydraulic pump and hoist for the Galion-Godwin dump body through a rear-engine power take-off, Mack's Rini explained. And while a hybrid trash truck might get away with a smaller diesel because it stops often to generate electric juice for launching, the dump truck would need a standard-size diesel because it doesn't stop as often.

But the engine can be derated somewhat because of the electric launch assist. The 11-liter MP7's normal ratings begin at 325 horsepower, but in these hybrids, it's set for 315. Add in the motor's 160 horses and there's 475 on tap. That won't make the truck fly, but it does take off with authority, and that gives this hybrid a real role in the Air Force's "wild blue yonder." CE

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By DIANA GRANITTO, Contributing Editor

Asphalt Products

On the Show Floor

Astec

Double Barrel combination aggregate dryer and HMA drum mixer can run up to 50 percent reclaimed asphalt pavement (RAP) without using additional fuel and virtually eliminates blue smoke emissions, says the manufacturer. The thermally efficient design transfers heat from the dryer shell through the tips and shanks into the asphalt mix. The long mixing chamber and stationary outer shell allow adding ingredients sequentially, creating a more consistent mix.



See Booth 850



Cimline

The second generation Magma Series melter/applicator line incorporates a new hose design, new wand construction and improved external pump design. The crack sealers are available in 110-, 230-, and 410-gallon models. Additional pavement-maintenance products to be exhibited include spray injection pothole patchers and seal-coating systems.

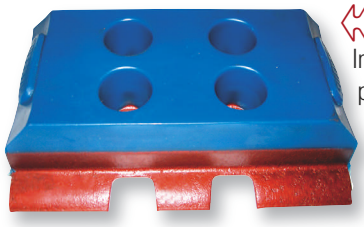
See Booths 531 and 831

Bomag

Model 4413 self-propelled asphalt paver uses a 60-hp turbocharged diesel engine said to deliver 40 percent more output torque than the engine on the previous model. The load-sensing hydraulic system saves fuel by delivering power only when needed. The undercarriage uses welded-steel crawler style components. The machine offers paving widths from 8 to 13 feet and can push asphalt feeder trucks while maintaining working speeds up to 160 feet per minute.

See Booth 611





BLS

Improvements have made polyurethane Tufpads Blues track pads 15 to 30 percent more durable than their black polyurethane predecessors, according to BLS. Designed for rough applications such as asphalt milling, the track pads are available in the original bonded style and the more economical bolt-on to a steel grouser. Contractors who select the Poly Bolt-On style will not need to replace the steel grouser, just the polyurethane pad, thus reducing replacement-part costs, labor time, and shipping weight.

See Booth 1301

Caterpillar

The CB-564D double-drum vibratory asphalt compactor features the Versa Vibe vibratory system, which offers four amplitude selections and two frequencies for a choice of high amplitude or high frequency in one machine. The water spray system features a polyethylene water tank enclosed within the machine frame, an automatic two-pump system that maintains even pump usage for uniform life, and constant and infinitely variable intermittent spray settings. Also on display will be the RM-500 rotary mixer and CB-200 Series utility asphalt compactors.



See Booth 811

Sneak Peek

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Everpads

Evertire bolt-on track pads, designed for maximum performance on high-production cold-milling planers, are made of wear-resistant rubber of high elasticity that absorbs shock and reduces noise. The pads are easily installed and replaced by bolting them to the grouser from behind. Chamfered edges reduce drag to allow smooth moving and turning.

See Booth 1338

Ingersoll Rand

The PF-6110 highway-class track-mounted paver improves control of material flow using an auger system that is independent of the conveyor system. Auger and conveyor drives use sonic sensors. Conveyor system chains are automatically tensioned and feature self-cleaning covers. Reversible augers and conveyors are optional. Hopper capacity of 14.4 tons yields a production rate of 820 tons per hour. Screed width is 10 feet, and maximum paving width is 26 feet.

See Booth 111





E.D. Etnyre

For safe handling of hot materials, the Black-Topper Centennial asphalt distributor delivers accurate liquid-asphalt applications with fingertip control of distributor functions and computer-controlled spray. The unit features custom-built tank sizes and is available with large cross-section spray bar or fully cab-controlled variable width sliding bar. Also on display will be Blackhawk construction equipment hauling trailers and Falcon live-bottom trailers and truck-mounted bodies.

See Booth 401

Coneqtec-Universal

The AP Cold Planer skid-steer attachment features an open drum said to increase productivity and reduce re-milling, dust, noise and uneven cuts; a front-down design that contains debris and in the milled strip; a center pivot that transfers the host machine's weight directly over the center point of the drum; and a direct-drive high-torque motor. Available in width sizes from 12 to 48 inches, with one- or two-speed motor and electric or hydraulic control options.

See Booth 346





Gradall

Model XL 4300-II excavator offers a tilting, telescoping boom and wheeled mobility on and off paved surfaces. High-pressure, load-sensing hydraulics automatically deliver the appropriate power and cycle times for the job. Low-profile boom enables the excavator to work under bridges and in tunnels. The boom's 220-degree tilting action serves on hard-to-reach sloped surfaces. Rated in the 45,000-pound class, the excavator features a maximum digging depth of nearly 21 feet and bucket breakout force of 25,449 pounds.

See Booth 411

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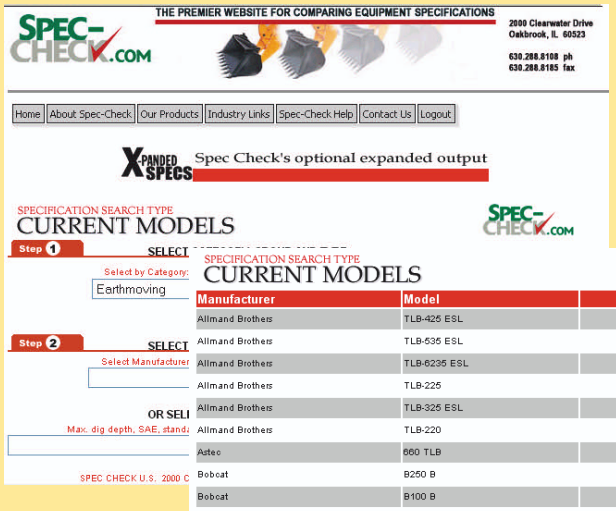

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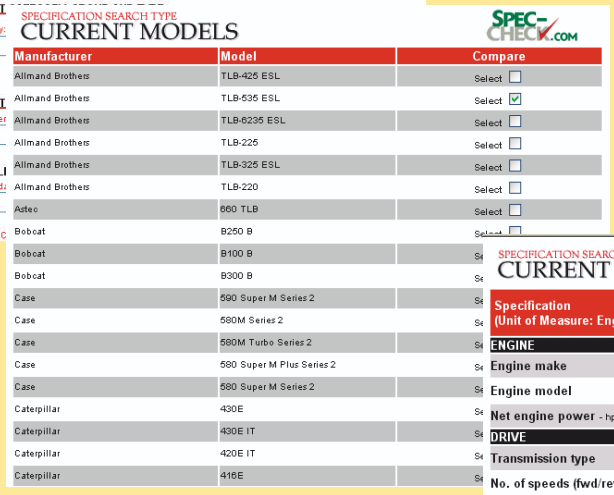

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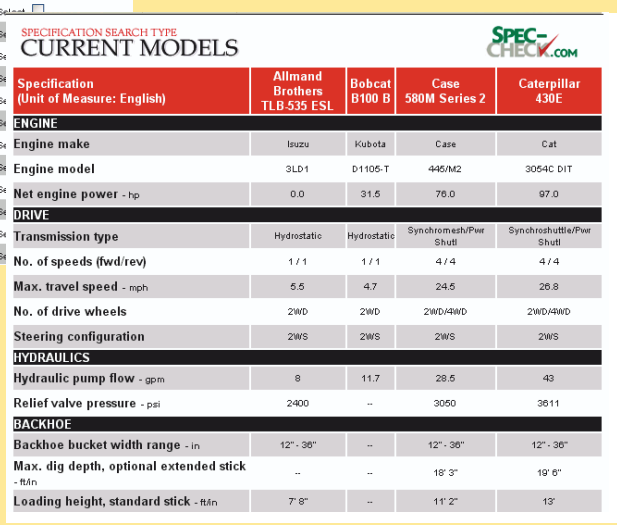

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World of Asphalt 2007 SHOW & CONFERENCE

TransTech Systems



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See Booth 931

Multiquip

AR Series tandem and combination vibratory rollers are available in 10 diesel-powered models with drum widths from 31 to 51 inches and centrifugal forces ranging from 2,925 to 10,790 pounds. Standard features include folding ROPS, dual frequency and amplitude, back-up alarms, noise attenuation, 100 percent side clearance through full flush drums, and lockable instrument panels.

See Booth 641



LeeBoy

The Rosco Maximizer 3 asphalt distributor features a hydraulically controlled, continuously variable spray bar that can be extended in 4-inch increments to 16 feet wide. Spray operations are performed from within the cab using a computerized system that matches the pump output to the distributor speed via radar speed-sensing equipment. The spray bar can be drawn in or out during operation for maneuvering around obstacles. Tank sizes range from 1,100 to 4,100 gallons.



See Booth 200

Mountain Valley Equipment

Stehr Manhole Cutter SKF 950 is a skid-steer attachment for new road construction as well as surface repaving and repair. The machine enhances productivity by dry cutting through asphalt at the rate of 1 inch per minute, with a cutting depth up to about 1 foot. A single operator can produce up to 15 manholes per hour. Carbide-tipped cutter teeth have a life span of about 40 cuts and can be replaced quickly and economically. Bit sizes range from 18 to 55 inches.

See Booth 311





Roadtec

A 4-foot milling machine with a rear-mounted drum, the RX-400 is designed for commercial work and other projects requiring a compact machine. The operator can begin the cut directly in front of curbs, fences, walls or other obstructions. RX-400 offers milling widths of 2, 3 and 4 feet and a maximum cut depth of 12.5 inches. Powered by a 325-hp Cat engine, the machine features a 60-degree conveyor swing to either side of center.

See Booth 841

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Sneak Peek

World of Asphalt 2007 SHOW & CONFERENCE



Sakai

Asphalt rollers and accessories line includes double-drum vibratory asphalt rollers that deliver 4,000 vibrations per minute high frequency; the GW750 vibratory pneumatic tire roller; combination steel wheel/pneumatic tire rollers; and balanced three-wheelers. The ExactCompact model, which enables the operator to maintain impact spacing on the run to prevent under- or over-compacting, will be demonstrated. A push-button control is used to preset the desired target figure.

See Booth 801

Wirtgen

Two mid-sized asphalt cold-milling machines will be introduced. Model W 120 F features a milling width of 4 feet, provides front-end loading of RAP via a larger two-part conveyor system, cuts to 12.6 inches deep, and can be equipped with wheels or crawler tracks. Model W 60, which cuts to 11.8 inches deep, features a flexible rear loader suited for trench and channel digging work. Also displayed will be Vögele asphalt pavers and Hamm asphalt compactors, including the new "Vibration Front, Vibration Rear" models.

See Booth 601



TSD Integrated Controls

Paver System Five offers fast, accurate screed control for high productivity and smoothness on asphalt or concrete-paving jobs, according to the manufacturer. The controller can be used alone or with the SmoothTrac sonic averaging system.

See Booth 531



Stone Construction Equipment

Designed to provide compaction in confined areas, WolfPac ride-on asphalt rollers feature hydrostatic drive, power steering, non-corrosive water systems, and high-capacity fuel and water tanks. Four models range from a 1-1/4 ton static roller for small patching and paving jobs to a high-volume, double-drum drive/vibration road machine with a 47-inch-wide footprint. Also exhibited will be the Silver Fox SFA3500, a forward plate compactor that delivers 3,500 pounds of eccentric force.

See Booth 1101



Ames Engineering



Profilers use state-of-the-art smoothness measuring technology that reportedly provides accurate and repeatable measurements when compared to true rod-and-level profiles. The Deere Gator-based lightweight mobile measuring device is the first to be Texas-certified and anticipates national certification via AASHTO PP 51-02.

See Booth 1131



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By MIKE ANDERSON, Senior Editor

Asphalt Pavers
Out to Do More

Manufacturers starting to look beyond single tasks with their highway-class machines



The design of Caterpillar's newest 10-foot asphalt paver models, including the wheeled AP-1000D shown above, eliminates the need for feeder gates. That's because the left and right augers and the left and right feeders can be controlled independently of each other.

If the current generation of construction equipment has one overwhelming differentiation, it is in the proliferation of multi-purpose machines. In many equipment types, the single-purpose unit has all but been eliminated as OEMs develop products built to work continually, from one task to another, each formerly performed by a different machine. Regardless, by their own unique designs and purposes, some equipment types may seem destined to steer clear of this trend. They are what they are, and nothing more.

Well, if you're thinking full-sized asphalt pavers are just that, think again.

In rolling out its CR662RM model in 2006, Terex Roadbuilding combined a material transfer vehicle with a highway-class paver. Bill Rieken, paver applications specialist, says it could be the wave of the future, "certainly from versatility and utilization standpoints, and the fact that it can be moved like a paver. The CR662RM has the same ground pressure as what a track paver has, and yet performs all the things a transfer vehicle would."

As a paver in the Terex Cedarapids line, the CR662RM's outboard bearing drive is a new feature with market potential, said Rieken. "Instead of the center spreading auger drive, we have two outboard drives to eliminate the potential for centerline segregation."

The availability of a multi-purpose machine in the paving train may require a different train of thought for managers and users.

"In about half a day, it can be converted from a transfer vehicle to a paver, or vice-versa," said Rieken. "If they elect the option to be able to take both approaches, either as a paver or transfer vehicle, then they can optimize the equipment a lot more than what they can as a paver alone or a transfer vehicle alone.

"I'm sure some contractors may just purchase it for one application or the other," said Rieken, whose company offers 14 full-sized paver models. "But just knowing that they have the option, should they so choose, to make it a transfer vehicle instead of a paver, or vice-versa, that has to create a lot of interest."

A survey of OEMs by *Construction Equipment* indicated seven in the North American market currently offer full-sized asphalt pavers (those weighing more than 19,000 pounds).

In addition to established 8-foot and 10-foot rubber-tired and rubber-tracked models,



A recent addition to the Terex Roadbuilding product line, the CR662 model combines a material transfer vehicle with a highway-class asphalt paver, providing the paving train with a multi-purpose machine.

Roadtec offers a new fifth model unique to the product line. The 10-foot SP-200 Spray Paver sprays tack and then applies hot mix asphalt seconds later, combining spraying and laydown for a "high-quality" mat with a strong bond between layers. A spray bar located just in front of the paver's auger distributes the liquid through computer-controlled, self-cleaning valves, arranged in sets of three for added capacity and faster paving. An onboard microprocessor controls the rate of flow.

Hot mix enters the SP-200's hopper from the chute of the Shuttle Buggy, the material transfer vehicle offered by Roadtec, an Astec Industries company. The Shuttle Buggy's ability to remix combined with the Spray Paver's strong bonding allows the laying of smooth pavement as thin as a half-inch.

Another OEM focused on allowing customers to do more with its pavers is Dynapac, as evidenced in the 2006 U.S. debut of "Kompact Asphalt Paving" on the test track of the National Center of Asphalt Technology at Alabama's Auburn University.

Allowing "hot-on-hot" monolithic pavement to be laid simultaneously in a single pass, the Dynapac F-300 C/S twin-paver consists of two hoppers: The upper hopper, holding the wearing course, has a capacity of 25 tons; the lower hopper, for the binder course material, holds 45 tons.

As demonstrated on the test track, the first of two screeds placed the binder course while compacting it to a density of up to 97 percent. The second screed placed the top course directly over the freshly placed binder and compacted it to a density of 92 percent. The screeds can be adjusted to reduce or increase compaction as required.

Following the demonstration, Dynapac vice president and general manager George Platt said the company is planning to bring the technology to market in the United States.

In the past 18 months, Ingersoll Rand has solidified its role as the most extensive provider of full-sized asphalt pavers, adding six models as part of a 19-model offering. In North America, all are marketed as Ingersoll Rand products, incorporating the former Blaw-Knox and ABG brands, the latter represented by the Titan product line.

The track-mounted Ingersoll Rand PF-6110 and wheel-mounted PF-6160 and PF-6170 models were introduced last fall, each incorporating an auger system now independent of the control system. Each of the two auger and conveyor drives use sonic sensors for more precise handling of material. Hopper capacity for the PF-6000 Series is 14.4 tons, giving each paver a practical production rate of 820 tph.

With hopper capacities ranging from 14.8 to 19.3 tons, Ingersoll Rand's new Titan 7820, 8820 and 9820 pavers feature Ingersoll Rand's Electronic Paver Management II (EPM II) control unit as a standard feature. The EPM II provides information on paver functions, operating conditions and machine diagnostics through an intuitive interface.

Similarly streamlined

Web Resources

Specifications	ConstructionEquipment.com
Caterpillar	www.cat.com
Dynapac	www.dynapac.com
Ingersoll Rand	road-development.irco.com
LeeBoy	www.leeboy.com
Roadtec	www.roadtec.com
Terex	www.terexrb.com
Vogele	www.vogeleamerica.com

in terms of brand offerings is Caterpillar, which incorporates the former Barber-Greene and Bitelli technology into a five-model Caterpillar product line, highlighted by the newly updated AP-1000D and AP-1055D models.

With a hopper capacity of 12.2 metric tons, both the wheeled AP-1000D and tracked AP-1055D models feature "the most advanced material-handling system in the paving industry," reports Cat Paving's Terry Sharp. The ability to control each of the left and right augers and left and right feeders independently of one another eliminates the need for feeder gates.

Highway-Class Asphalt Pavers (by weight)

Model	Operating Wt. (lbs.)	Max. Paving Width (ft./in.)	Gross HP
Ingersoll Rand Titan 2820	20,925	13'1"	81
Ingersoll Rand PF-161*	23,000	19'0"	107
LeeBoy 8816	25,000	16'0"	130
Ingersoll Rand Titan 3870*	26,674	16'3"	99
Vogele 2111W*	27,180	17'6"	110
Ingersoll Rand PF-2181**	27,650	21'0"	158
Terex CR352L***	28,760	18'0"	165
Vogele 2116T	28,880	17'0"	160
Caterpillar AP-800D*	29,310	8'0"	130
Ingersoll Rand PF-3172	29,870	21'0"	158
Roadtec RP-150**	30,040	18'0"	155
Ingersoll Rand PF-3200**	32,700	30'0"	188
Dynapac F 121 6W*	33,069	23'7"	158
Terex CR452***	34,595	28'0"	220
Ingersoll Rand Titan 272-3*	35,015	24'7"	152
Ingersoll Rand Titan 373-2 / 473-2**	36,559	26'3"	152
Ingersoll Rand Titan 7820	35,720	32'10"	231
Caterpillar AP-650B	37,455	20'2"	130
Terex CR552***	37,470	30'0"	260
Dynapac F 141 CR	38,139	19'6"	173
Caterpillar AP-1000D**	39,320	24'2"	224
Roadtec RP-190**	40,000	16'0"	225
Ingersoll Rand PF-6160***	40,352	26'0"	205
Caterpillar AP-655C	40,800	20'5"	174
Vogele 2219T	41,800	25'0"	190
Ingersoll Rand Titan 8820	42,115	42'8"	247
Terex CR662RM	48,300	26'0"	260
Roadtec SP-200	62,500	19'6"	200
Ingersoll Rand Titan 9820	52,038	52'6"	371

Unless identified with asterisk, the model represented is a tracked paver only.
** Wheeled paver model only. ** A wheeled paver model, for which a comparable tracked model is available.*
**** A wheeled paver, for which comparable steel- and rubber-tracked models are available.* *Source: Spec-Check.com*

Vogele America, a member of the German-based Wirtgen Group, offers five "lane-width" asphalt pavers, all U.S.-designed and built in Chambersburg, Pennsylvania. Depending on the size of the screed mounted, each of the third wheeled and two tracked models will pave 10-foot-wide sections.

Vogele America has uniquely mounted the drive motors on the outside ends of the torque hub, allowing any leaks in seals or hoses to be immediately visible. Another Vogele exclusive is the use of two hydraulic motors on the final drive of the 10-foot-class 2219T tracked model. All four shifts may be done hydraulically, permitting smoother and more efficient shifting, including shift-on-the-fly at any speed.

Renowned for smaller, commercial-sized asphalt pavers, LeeBoy moved into the full-sized paver market with the 25,000-pound 8816 model, offering owners the option of a conventional propane-heated Legend screed system or the new Legend Electric system. The electric system eliminates the flame, fuel or fumes, while offering consistent temperature control of the heating elements across the width of the screed plate and extensions.

Productivity is enhanced with the LeeBoy 8816's under-auger cutoff doors and independent control of hopper conveyor and material augers to control asphalt flow to the screed.

The future of mainline paving technology is not without frustrations, according to Terex Roadbuilding's Rieken.

"For highway applications, continuous paving is going to be more and more required," he said, "and how are you going to do that?

"Every state has a different spec," he explained. "Unfortunately, without intent, the states have kind of gotten in the way of technology, by trying to pick the technology that's out there that they're aware of, instead of keeping the door open for all of the technology."

The select manufacturers in the game will undoubtedly look to do more with the products they offer. CE

What's your opinion? Go to the online article at ConstructionEquipment.com and post your comments at Talk Back.

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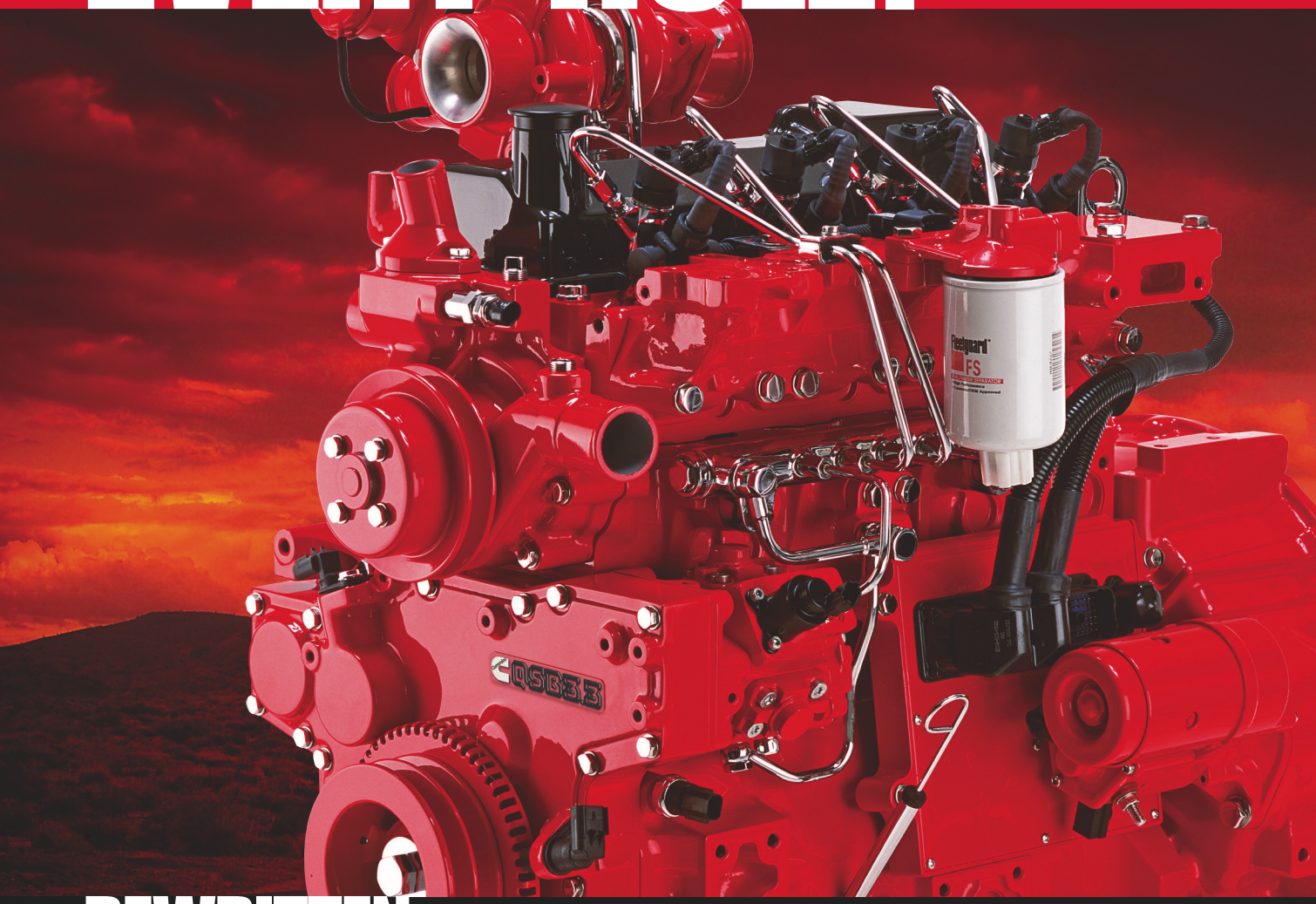

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Gallery of Full-Sized Asphalt Pavers



CATERPILLAR

Wheels, Tracks, or the Best of Both

Caterpillar recently announced changes to its high-production asphalt paver line that results in two new 10-foot-class models. Powered by a new 224-hp Cat C7 engine with ACERT technology, the wheeled AP-1000D and tracked AP-1055D asphalt pavers have a Cat-exclusive material-handling system that utilizes the machine controller to precisely control the augers and feeders, as well as calibrate and monitor material handling. The AP-1055D model can be fitted with a steel track undercarriage, or with a Mobil-trac undercarriage that combines the traction and flotation of a crawler with the speed and ride of a wheeled machine.

Number of models: 5

New models: AP-1000D, AP-1055D

Product-line features: With Cat's material-handling system, the ability to control each of the left and right augers and left and right feeders independently eliminates the need for the D-Series asphalt pavers to have feeder gates. Rather than raising or lowering gates to control material volume, the feeder's speed can be set to provide the precise material volume needed to the augers.

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INGERSOLL RAND

Sensors Provide More Precise Material Handling



Late in 2006, Ingersoll Rand rolled out one new track-mounted and two wheel-mounted models as part of its PF-6000 Series of highway-class asphalt pavers, each featuring an auger system independent of the conveyor system. For more precise handling of material, four sensors are now located on the feed system, specifically one on each of the two conveyors and two augers. The conveyor system has chains that are automatically tensioned. The PF-6000 Series machines have dual control stations, each of which rotates and pivots at two points for comfort. Each seat can be extended beyond the edge of the machine for improved visibility.

Number of models: 19

New models: PF-6110, PF-6160, PF-6170, Titan 7820, Titan 8820, Titan 9820

Product-line features: The PF-6000 Series pavers will accommodate a variety of fixed and hydraulically extendable screeds, allowing the paver to place a wide range of materials, from stone mastic asphalt and roller-compacted concrete to non-treated and cement-treated base. Contractors may, as such, cash in on the versatility of owning one tractor with a multitude of screeds.

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LEEBOY

Product Line Grows into Highway Market

A renowned brand in commercial-sized asphalt paver production, LeeBoy moved into the highway-paver market earlier this decade with the introduction of the 8816 model. A 25,000-pound, 130-hp paver designed for roadway and large commercial applications, the 8816 can pave base material or asphalt topcoat up to 6-inch depths at infinitely variable widths from 8 to 15.5 feet.

Number of models: 1

Product-line features: With the new Legend Electric Screed Heat System as an option, the 8816 gives paving contractors an alternative to propane as the heating fuel source. Powered by an on-board generator, the Legend Electric Screed Heat System offers the safety benefit of no flame, fuel or fumes in the screed heating process, along with consistent temperature control of the heating elements across the width of the screed plate and screed extensions.

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Gallery of Full-Sized Asphalt Pavers

VOGELE

Screed Options Offer Highway Coverage

Vogele America offers five lane-width asphalt pavers, all designed and built in the United States. There are three rubber-tired models — the 2111W and 2116W in the 8-foot class and the 2219W in the 10-foot class — as well as the rubber-tracked 2116T and 2219T models in the two size classes, respectively. These five asphalt pavers are served by four Vogele America screeds, collectively offering a choice of electric and diesel heat in both machine size classes. All screeds offer hydraulically extendable extensions.

Number of models: 5

Product-line features: Depending on the size of screen mounted, each Vogele America model will pave 10-foot-wide sections. To ensure a longer and more reliable life in the rubber track bands, the cables were beefed up, increasing track strength by 50 percent. The track frame was likewise bolstered to enhance rigidity, longevity and alignment. Uniquely, Vogele America has mounted the drive motors on the outside ends of the torque hub. Should a leak in a seal or hose occur, it will be immediately visible.

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DYNAPAC

Highway Paving Goes 'Kompact'

Dynapac's most recent asphalt-paving innovation allows the simultaneous laying of the wearing and binder courses in a single pass. Known as Kompact Asphalt Paving, the process allows "hot-on-hot" monolithic pavement to be laid simultaneously in a single pass by a Dynapac F-300 C/S twin-paver, featuring two hoppers. The upper hopper, at a capacity of 25 tons, holds the wearing course. Holding the binder course, the lower hopper has a 45-ton capacity.

Number of models: 3 in the United States

Product-line features: With the F-300 C/S twin-paver, two screeds are fed by the two different hoppers. The first screed has the ability to place the binder course while compacting it to a density of up to 97 percent. The second places the top course directly over the freshly placed binder and compacts it to 92-percent density. This model joins the 8-foot F 121 6W wheeled paver and F 141 CR rubber tracked paver models available in the United States, the latter of which is capable of working with screeds up to 10 feet.

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ROADTEC

Spray Paver Model Combines Tasks

On top of its established 8-foot and 10-foot rubber-tired and rubber-tracked asphalt pavers, Roadtec added a fifth full-sized model with the SP-200 Spray Paver. At a shipping weight of 62,500 pounds equipped with an Eagle 10 screed, the SP-200 sprays tack and then applies hot mix asphalt seconds later, thus combining spraying and laydown for a high-quality mat with a strong bond between layers. Roadtec has also redesigned the 10-foot RP-190 and RP-195 models with slideout operator stations for better visibility.



Number of models: 5

New model: SP-200

Product-line features: The redesigned 10-foot RP-190 and RP-195 models utilize Caterpillar Tier 3 engines, which run at 1,800 rpm, providing a 4-percent gain in fuel economy and a 5-percent decrease in operator noise. The 90 Series pumps run at the bottom of their engineered range for cooler operation and longer life.

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Gallery of Full-Sized Asphalt Pavers



TEREX ROADBUILDING

New Model Handles Paving and More

With the ability to be used as both a material transfer vehicle and a paver, the new Terex Cedarapids CR662RM model by Terex Roadbuilding significantly increases utilization rates. As a paver, the CR662RM features a new style of outboard auger drive, replacing the center gearbox design. This eliminates the chance for centerline segregation, thus improving mat quality. Also recently introduced, the CR300L Series paver models offer more highway-class features than traditional 8-foot-class machines, including a longer receiving hopper.

Number of models: 14

New models: CR352L, CR362L, CR362SL, CR662RM

Product-line features: The CR662RM features a new generation of the Remix Anti-Segregation System, in which constant 12-inch-diameter augers with a variable pitch are able to draw material down throughout the entire shaft length. The counter-rotating augers aggressively reblend the material to reduce both thermal and particle segregation. Material is pulled from all areas of the hopper, providing a more homogeneous mix.

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By MIKE ANDERSON, Senior Editor

Soil Stabilizers

ROADTEC

Capable of cutting 102 inches in width and 21 inches in depth, the SX-7 can prepare a 24-foot road in three passes. Powered by a 700-hp Cat engine, the four-wheel-steer SX-7 can be controlled from any of the two front and two rear wheels, and is also able to crab sideways. The control console and operator's seat swivel 180 degrees, and the machine can be operated from the right or left side. With its right-hand flush cut, the SX-7 can stabilize all the way to the curb line.

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WIRTGEN

Capable of milling and recycling to a depth of 20 inches, the WR 2400 provides a working width of 94.5 inches. This places it between the 79-inch WR 2000 and the larger 96-inch WR 2500 S and 120-inch WR 3000 S models. The all-wheel-drive, 563-hp WR 2400 features high ground clearance due to Wirtgen's proven vertical lifting column design, suited for working through rough terrain. Four different steering modes enhance machine maneuverability.

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BOMAG AMERICAS

With the January introduction of the MPH122-2 model, Bomag Americas offers a number of improvements in its smallest of three recycler/stabilizer sizes. The MPH122-2 features a Tier-3-compliant Deutz V6 engine that, at 482 horsepower, provides about 9-percent more output than the previous model. Additionally, the MPH122-2 offers three rotor options: a 91.7-inch-wide stabilizer rotor with Kennametal paddle-type teeth and a 19.7-inch cutting depth; a 99.6-inch-wide universal rotor with a 16.5-inch cutting depth; and the 99.6-inch-wide universal rotor with bolt-on Kennametal tooth holders. As with the predecessor model, the MPH122-2 has an integrated hydrostatic rotor drive. The maximum working speed is 211 feet per minute.

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CATERPILLAR

Caterpillar introduced the RM-300 and RM-500 rotary mixers as replacements for the RM-250C and RM-350B reclaimer mixers, respectively. At 350 and 540 horsepower, the RM-300 and RM-500 utilize Tier 3 Caterpillar C11 and C15 engines with ACERT technology. With the new rear wheel-assist option, larger rear tires, and the universal rotor option, the RM-300 is now better equipped for those tougher jobs requiring maximum-depth soil stabilization in moisture content such as lime slurry.

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TEREX ROADBUILDING

The four-wheel-drive RS425C is the newest of four reclaimer/stabilizer models offered by Terex Roadbuilding, featuring an enhanced drive locking system that divides oil flow between the front and rear drive motors. The 70/30, front-to-rear flow ensures the RS425C continues to move forward should one wheel lose traction. A second steering cylinder has been added to the rear, delivering easier rear-wheel steering when working in deep cuts. With a 49,000-pound transport weight and a standard height of 126 inches, the new 415-hp RS425C can be moved quickly from site to site.

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KA07

By MIKE VORSTER, Contributing Editor

How to Produce Actionable Cost Information

To avoid drowning in details, consider how to divide cost and fleet information into levels of information

When someone shouts "Fire," it is important to know which exit to take. It is exactly the same with equipment costs: When you identify a cost overrun, it is important to know where to go and what action to take.

Knowing that your equipment account generated $15,208,621 in revenues against a cost of $14,448,189 confirms that there has been an overall gain of 5 percent. What you do not know is that your scraper fleet is substantially over budget because of low utilization, or that your fuel bill is $190,000 higher than budget for reasons entirely beyond your control.

In order to manage costs, you have to be able to split the overall picture in two directions: horizontally according to the responsibility structure in the organization and the level of information required, and vertically according to cost category. This enables you to identify where the problem lies and to take action based on knowledge rather than supposition.

The resulting matrix could become unwieldly without much imagination. In order to produce actionable information without drowning in detail, we must look at how to divide the fleet into the necessary levels and how to define cost categories.

Information levels

At the lowest level, we can collect information by component and then use data on individual engines, pumps and transmissions to run a preventive-maintenance program. The benefits certainly outweigh the costs, but there must be reason to collect this data and systems must be in place to ensure that we are able to manage all the detail information produced.

Individual units make up the next level. Most organizations manage at this level and calculate cost and other performance indicators for individual machines. Without unit-level information, it is impossible to make good repair-rebuild-replace decisions. Unit level information is the starting point for an effective equipment-management system.

In the next level, individual units are grouped together into classes comprising machines of a similar type, size, capability and



Mike Vorster

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

Information Levels

Unit	Class	Group	Operating Fleet	Fleet
Repair, rebuild replace decisions are made at a unit level. Good unit decisions optimize class performance.	Similar units with the same capability, capacity and cost form a class. All units in a given class have the same cost recovery rate. Performance metrics are set within a class, and units are measured relative to class performance. Costs and recoveries for units must balance within a class.	Classes with the similar financial performance, reliability and production expectations are combined into groups. Groups support different company functions. Costs and recoveries balance within groups so that each function carries its true costs.	Units within a given class and group are assigned to operating fleets. Operating-fleet results are the responsibility of operating business units. Operating business units experience true cost of owning and operating their fleet.	Good operating fleet decisions produce good corporate results.

Good decisions improve results at the next level. Classes, groups and operating fleets ensure that true cost is known at each level of responsibility.

cost-recovery rate. Cost, average age, reliability and other performance metrics are established at a class level, and unit-level decisions are taken to ensure that the class produces the best possible results. Classes should be clearly defined, cost-recovery rates should be balanced within a class, and operations should not be concerned with which loader is sent to site to work on a given crew.

Two additional levels are important for summarizing information and balancing budgets. First, classes should be assigned to defined groups of machines that perform similar functions and for which there are similar financial and performance expectations. The grading group, for example, would be the principal production group for most heavy construction companies. There should be well-defined financial, performance, reliability and production targets for this group. Cars and pickups form different groups as do trailers, message boards and the like that are used to support site activity.

It is absolutely impossible to manage a fleet or take appropriate corrective action without knowing how things are going relative to budget on both the owning and the operating sides of the house.

Costs for different groups are incurred and recovered in different ways and there are frequently different financial expectations for each group. The important thing is that groups must balance their own books and that groups should not subsidize each other. Production groups cannot and should not subsidize site trailers and pickups or visa versa.

Next is the operating fleet level. Most large companies decentralize financial responsibility by assigning units in a given class and group to operating fleets that become the direct responsibility of a given business unit. Again, the books must balance within each operating fleet, and the management of a business unit must experience, know and feel the true cost of owning and operating the fleet they use to produce completed construction.

Cost categories

The first and most important division of cost into categories requires a clear distinction between owning and operating costs (see Four Keys to Control Owning and Operating Costs, October 2003). The principal challenge with owning costs is to ensure that machines work sufficient hours to recover fixed annual costs at a reasonable unit rate. With operating costs, the principal challenge is to improve maintenance, repair and rebuild decisions. It is absolutely impossible to manage a fleet or take appropriate corrective action without knowing how things are going relative to budget on both the owning and the operating sides of the house.

How to Split the Cost Picture

	Depreciation	Parts	Fuel	Total
Loaders				
Dozers		Actionable		
Trucks				
Tractors				
Total				Not actionable

This simple setup shows a division of costs vertically and a division of responsibility structure horizontally. Actionable information is produced when we know what the problem is (parts cost) and where it is (in the dozer fleet). Totals do not provide actionable information.

Owning costs should, as a minimum, be further divided into the purely financial costs associated with depreciation; interest; loans and leases; and the annual costs associated with licenses, insurances and property taxes.

Proper management of operating cost requires that fuel and preventive maintenance are separated out, accounted for and managed separately. Tires or tracks and ground-engaging tools vary with application and location and can gainfully be combined into another category. That leaves repair parts and labor as a separate and important category that varies with machine age and lies at the heart of unit repair-rebuild-replace decisions. Managing them separately and comparing actual hourly costs with carefully set budgets and norms is essential for proper control.

Information is only of value if it causes you to take the right action and improve performance. Global figures that do not assist in identifying the root cause of the problem are of little value and frequently cause incorrect or inappropriate action. Information that is at too fine a level of detail can mask the true problem. A careful division of the fleet into units, classes and groups, and the classification of cost into appropriate categories, will strike a balance and produce cost information that improves the speed and accuracy of decisions. CE



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By LARRY STEWART, Executive Editor

KXO80-3 Excavator Carries Kubota Beyond Minis

The 18,300-pound crawler excavator is among the largest 8-ton swing-mounted booms



Auto-idling is a standard feature on Kubota's KXO80-3. It drops engine speed to an idle to reduce noise and exhaust emissions when there has been no operator input to the controls.

Kubota dug into the utility-class excavator market, for the first time reaching beyond mini-excavators, with the 18,300-pound KXO80-3. It is the heaviest excavator of the machines in the class with a swing-mounted boom. The 62-hp engine is Kubota's first direct-injected diesel in an excavator.

The quiet Kubota diesel engine can drive 14,660 pounds of bucket force and 8,554 pounds of arm digging force. The standard auto-idling system drops engine speed to an idle to reduce noise and exhaust emissions when there has been no operator input to the controls for a period. As soon as the operator moves a control, the revolutions per minute come back to the preset high-idle.

The counterweight extends 14.2 inches beyond the track width — a bit large compared to most tight-tail-swing machines in the 8-ton class — but Kubota says the unit delivers more over-the-front lifting capacity at maximum reach than fixed-boom machines such as Cat's 308CR and Komatsu's PC78US-6. The Kubota is less stable lifting over the side of the tracks than those fixed-boom machines, but it out-lifts Takeuchi and Bobcat's competitive swing booms.

Ground-drive motors in the KX080-3 automatically downshift to low when making turns, moving on soft earth, or when the machine encounters heavy-duty drive situations.

The front-end implements handle smoothly thanks to a three-pump, load-sensing hydraulic system. The system enables users to perform simultaneous operations, such as dozing and using front attachments, without losing speed. Twin auxiliary-service ports — standard equipment — each offer a hydraulic flow rate of up to 26 gallons per minute.

The KX080-3's electronic oil control allows easy auxiliary-flow adjustment to match the needs of various attachments. Operators can store settings to quickly switch from using a tilt bucket, for example, to manipulating an auger or thumb.

The machine is only available with ROPS/FOPS-certified cab, air conditioning and heat. An anti-drop valve on the boom is standard equipment.

Kubota says the excavator has "the industry's first factory-installed anti-theft system." The system allows only registered keys to crank the engine. Attempts to use other keys disable the machine and sound an alarm. Each excavator comes with ready-to-use, pre-registered keys, and a programming key for registering additional keys or changing codes.

The KXO80-3 is expected to sell for about $75,000.

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By WALT MOORE, Senior Editor

Design Overhaul for Wacker's New Ride-On Rollers

These models are more powerful and maneuverable than the machines they replace



Above: The Wacker RD 16-90 is suited for compacting base and finish layers of asphalt, says Wacker, as well as for compacting granular sub-base materials in confined areas. The new model is 5-plus inches shorter, overall, than its RD 15 predecessor.

Wacker recently introduced its new generation of ride-on asphalt rollers, models RD 12-90, RD 12A-90 and RD 16-90, all of which now are designed and manufactured at the company's Menomonee Falls, Wis., headquarters. The new models have been substantially redesigned, compared to predecessor models, and feature a range of enhancements in the areas of performance and operator convenience.

The RD 12 Series, for example, based on the company's popular RD 11, has a redesigned frame that eliminates its predecessor's rear overhang, resulting in enhanced visibility, more precise maneuverability, and the ability to reach the edge of the mat for complete finishing. Overall, the new RD 12 models are some 10 inches shorter than the RD 11, but the wheelbase has actually been lengthened.



RD 12 Series machines measure 71.8 inches in length and 40.8 inches in width. Unballasted operating weight is 2,490 pounds, and with ballast in the rear drum, 2,690 pounds.

The RD 12 models, when using ballast in the non-vibrating rear drum, have an operating weight of 2,690 pounds and deliver a dynamic (centrifugal) force of 3,400 pounds (a 15-percent increase compared with the RD 11). Drum frequency for the Wacker-powered RD 12-90 is 4,200 vpm, and that for the Honda-powered RD 12A-90 is 3,900 vpm. The machines have maximum horsepower ratings (at 3,600 rpm) of 20.5 and 18, respectively, and feature hydrostatic dual-drum drive, articulated-frame steering and 35.4-inch-wide drums.

Also contributing to the mat-finishing ability of the new RD 12 models, says Wacker, is a pressurized water system. This new system replaces the gravity-flow system of the predecessor model and is designed to deliver more efficient and more consistent water flow. A water-pump timer allows the operator to select eight flow rates to match rolling conditions. The efficiency of the new pressurized system, according to the company, allows the size of the water tank to be reduced (from 40 to 26.4 gallons), but allows a longer running time.

A new, larger operator's station is designed to reduce vibration on the platform, says Wacker, while also promoting quieter operation. A sloped hood enhances forward visibility, and a "user-friendly" control panel features a right-hand forward/reverse lever with integrated vibration control.

Also new to the Wacker asphalt-roller line is the larger RD 16-90. This 3,274-pound unit, with a 26.8-hp, two-cylinder Lombardini diesel engine, offers the same new features as the RD 12 Series, including the new chassis design, pressurized water system, ergonomic enhancements, and increased compaction performance. Both the front and rear drums vibrate and can produce up to 6,800 pounds of total centrifugal force. A standard "foldable" ROPS facilitates transport and storage.

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By ROD SUTTON, Editor in chief

Climb Up, Over With Moveable Controls

National Crane's 1300H features patented control console that folds up for transport, then moves to where operator wants it for lifting chores

National Crane's new Series 1300H stand-up control crane introduces the Easy Reach control console, which moves from one operator station to the other. This patent-pending technology has been so successful, says Chris Bratthauar, marketing communications manager, that it will be incorporated into other models in the National Crane lineup.

The control panel folds up in-line with the turret for transport. Unlatching the spring-assisted console allows for "effortless" movement into the operation positions, says Mike Herbert, senior project engineer. "When the operator has to move between the load on the ground and the controls on the truck, he doesn't have to constantly walk around the bed to reach the controls or climb over the payload to reach the ground," he says.

The new technology also provides pilot-operated hydraulics, which Herbert says no other stand-up control crane has. Valves are located behind a hinge door for easy service access, he says. "Service technicians can open the hinged door and easily reach the crane's plumbing, hydraulics, gear box, and other components," says Herbert. Outriggers can be fully controlled, front and rear, and the front stabilizer controls feature "first-up" functionality when retracting outriggers. Other amenities of the operator station include a 12-volt power outlet, hourmeter, cup holder and stop/start switch.



Above: Easy Reach control console folds in-line with the crane turret for transport. Operators can then easily access the truck bed.



National Crane's 1300H series stand-up control crane has a 30-ton capacity, and it can be mounted on a three-axle truck.

The 1300H is a brand new model for National, filling the gap between the 1100 series and 1400H series. The 30-ton-capacity crane can be mounted on a three-axle truck, while maintaining an overall vehicle length of less than 40 feet and carrying more than 3 tons of payload, the company says.

The four-section boom is available in 69-, 100- or 110-foot lengths. Maximum tip height is 162 feet with the 110-foot boom and 44-foot jib. An optional 25- to 44-foot two-section jib is available.

Other options on the 1300H include front stabilizer for a 410-degree working area, radio remote controls, personnel baskets, and a removable steel bulkhead.

What's your opinion? Go to the online article at Construction Equipment.com and post your comments at Talk Back.

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Market Watch Lite

By KATIE WEILER, Managing Editor

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Ashland Industries



In April, Ashland Industries will release its 2.5-cubic-yard 25SS Track Loader Scraper. The 2,900-pound scraper attachment mounts to the quick-attach plate of compact track loaders and large skid-steers, and it can move three to four times the payload of ordinary buckets. Most of the load rides on the attachment's front castering wheels. The loader pushes through its frame, with its lift arms resting against the frame. The loader's single auxiliary-hydraulic circuit powers the lift and dump functions of the 25SS, allowing it to load, carry, grade, backdrag, and most other functions that a bucket can do.

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Multiquip

Three gas-powered models (MTX-70, MTX-80 and MTX-90) are included in the MTX Series. These rammers deliver up to 3,500 pounds of impact force for compaction of cohesive and mixed soils. Impact-force ratings are 2,900, 3,150 and 3,500 pounds, respectively, and maximum blows per minute range from 645 to 700. All three models feature recoil starting, travel speed up to 36 fpm, and diaphragm carburetors that allow transporting the units without flooding the engine.

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TruckWeight



Smart Scale is a wireless onboard scale for trucks, tractors and trailers. The unit's wireless reader allows operators to monitor axle weights from up to 500 feet away. An operator can monitor how much payload he's placing on the vehicle and how the weight is distributed across the axles. This reduces overweight violations and time spent redistributing loads. List price is $550 for each sensor and $490 for the hand-held receiver.

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Halex Coil



The Halex Coil fits over a conventional oil filter and creates a magnetic field (within the filter) that pulls both ferrous and non-ferrous metal particles from the dirty-oil stream. According to the manufacturer, the powerful, rare-earth neodymium magnet positioned at the base of the coil draws contaminant particles (too small for the filter to trap) to the sides of the filter canister, where they are kept from circulation. Also, says Halex, the coil can trap non-ferrous particles by "sandwiching" them between ferrous particles, and also by the phenomenon of "paramagnetism," which involves magnetization and attraction of non-ferrous particles. Even with the coil, says Halex, oil analysis remains effective, because new base-line numbers are established for both new and old engines.

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Multiquip

Four MQ/Whiteman B-Series walk-behind power trowels with 46-inch ring diameters and six J-Series models with 36-inch ring diameters feature more powerful engines to generate improved rotor speeds of between 60 to 155 rpm for smoother finishes. The four-blade machines offer an ergonomic throttle control, lifting bail, and rugged spider assembly for extended life. A new access panel makes it easier for technicians to grease the unit, change blades, and service trowel arms.

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Kenco



Wedgebolt attachment coupler system allows users to quickly exchange attachments regardless of brand, the company says. Available in models to fit all excavators up to 100 tons, the coupler allows an operator to remove two bolts, change the attachment, and replace the bolts. The coupler maintains excavator breakout force and bucket tip radius, the company says.

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Allied



Skid-Pac Model 1000 is a compaction attachment for skid-steer loaders that operates with an impulse force of 8,000 pounds at 2,000 cycles per minute. Configurations of the Skid-Pac allow it to operate with a minimum hydraulic flow of 12, 18 or 21 gpm. It connects to the universal coupler and fits machines weighing from 4,000 to 14,000 pounds. The base of the compactor plate provides a 9-square-foot surface, and the attachment can be operated when the loader is moving forward or backward.

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Wacker

GV series of commercial-grade, portable generators is aimed at the "value-conscious" contractor who needs reliable power for such tools as electric pumps, breakers, drills, concrete vibrators, saws, lights and heaters. The new units are powered with Honda OHV engines that feature low-oil shutdown and one-pull starting. An automatic-idle feature reduces wear, noise and fuel consumption. The full 120V power switch offers maximum 120V or 120/240V power.

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Wacker

BSF-Series walk-behind concrete saws position the engine directly over the cutting area. A V-belt transmits power from the engine directly to the cutting shaft, which features double-sealed bearings. The BSF Series includes three standard and two self-propelled models. Standard models are available with 14- and 18-inch blade-guard diameters and can use either a 9-hp Honda or Wacker engine; the self-propelled models feature blade-guard diameters of 18 or 20 inches and are equipped with Honda engines.

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Miller Electric



Millermatic 140 electrical welder is an all-in-one MIG welder replacing the company's Millermatic 135. Patent-pending Auto-Set automatically sets wire feed speed and voltage; the user only needs to set the wire diameter and material thickness. This works with C25 gas and either .024 or .030 solid wire. The 115-volt unit can weld up to 3/16 inch in a single pass, the company says.

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Wacker



The Hybrid Heads internal concrete vibrators combine the technology of the round-head and square-head designs. The result, says Wacker, is more surface area that promotes maximum energy transfer to the concrete. The Hybrid Head also incorporates an "optimized" eccentric weight, which is designed to increase the amplitude of operation. Hybrid Head vibrator series includes the H 25HA (1-inch diameter), H 35HA (1-3/8-inch diameter), H 45HA (1-3/4-inch diameter) and the H 50HA (2-inch diameter).

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Leica

SmartPole enables users to determine coordinates and orientation on-the-fly while conducting the survey, using both GPS and TPS, the company says. The tool is added to System 1200 series. Users find the most convenient location for positioning the total station. Then each TPS setup can be conducted independently with new coordinates, using the SmartPole GPS.



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Atlas Copco

Atlas Copco added four hydraulic-powered core drills by acquiring Lifton. The drills are for free-hand use, but they can also be mounted on standard rigs. Four models are in the line, each weighing 18 pounds and requiring 5.3 gpm of oil flow. Model LCD 5, LCD 10, LCD 15 and LCD 24 feature non-kickback operation. The widest drill-diameter range is 3 to 8 inches with a rotation speed of 600 rpm (LCD 5), and the narrowest is 0.5 to 1.2 inches at 2,400 rpm (LCD 24).

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Wacker

The IRSEN-FU internal concrete vibrators feature an integrated inverter and an operating handle that is designed to reduce hand-arm vibration. With an integrated frequency inverter, the vibrators are designed to deliver stable, three-phase electricity to the motor when connected to a 120-volt, single-phase power source.

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The XTS silt fence installer accommodates fabric 48, 42, 36 inches and smaller, using a single-fold rear discharge fabric chute to place up to 20 inches deep. Units are available with 3-point hitch or dedicated skid-steer mount, or 72- or 84-inch sliding offset mounts. Forward-mount pivot allows for a swing of 40 degrees either side of center.

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Allied

Hammerhead II Model HB 550 is a concrete-demolition tool designed to "rubblize" flat work up to 12 inches thick. The attachment, which weighs 1,130 pounds and will operate either vertically or horizontally, uses an internal hydraulic-cylinder-and-valve system to compress a heavy spring that "loads" the tool to a pressure of 3,350 psi. This mechanism causes the 4-inch impact bar to fire at the concrete with a force equivalent to a tool with a 4,000-foot-pound energy-class rating. The tool operates at a rate between 25 and 40 bpm.



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BLS

The polyurethane compound in BLS TUFPADS Blue track pads is formulated to provide 15 to 30 percent longer pad life in milling-machine applications than did the compound used in the standard BLS TUFPADS track pads. The new track pads are available in both bonded and bolt-on configurations for all sizes of milling machines.

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Kwik Mag



The electromagnet attachment has a quick-attach plate for use on most makes of skid-steer loaders that have 2,000-pound lifting capacity, 20-gph hydraulic flow, and case drain connection. The magnet has a hydraulic motor coupled to a 5.5kw generator, an extendable magnet boom, and wireless remote control. It has a one-year warranty.

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Wacker



The BTS 1140L3 cutoff saw, powered by a 6.1-hp two-stroke-cycle engine, uses a 16-inch-diameter blade and provides cutting depths to 5.7 inches. The saw weighs 23.4 pounds and features a "Long-Life-Lubrication" (L3) piston with a special graphite surface coating to minimize piston and cylinder overheating during continuous operation. The BTS 1140L3 uses a multi-ribbed belt for power transmission and employs an air-cleaning system that automatically shakes dust from the primary filter.

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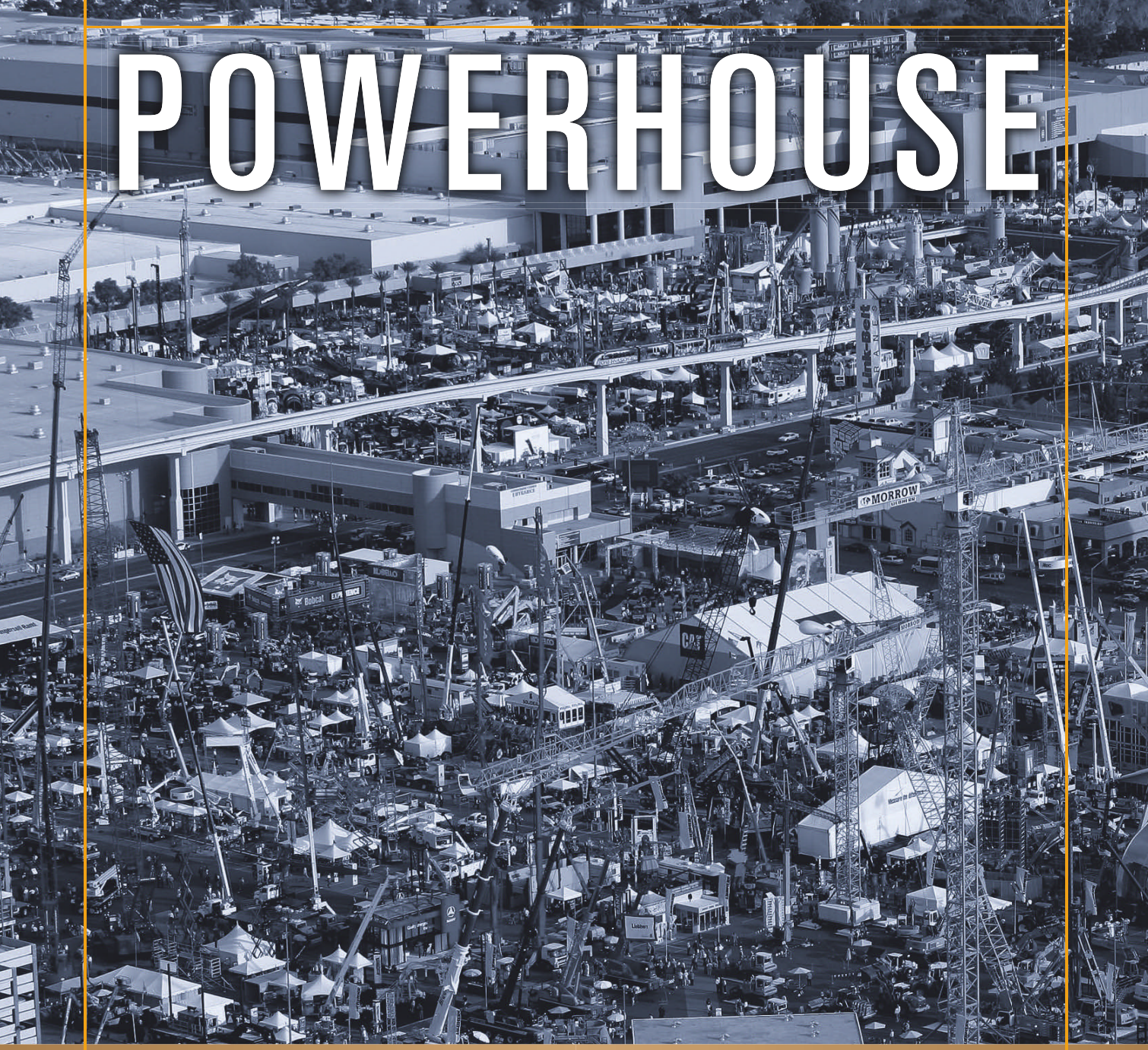

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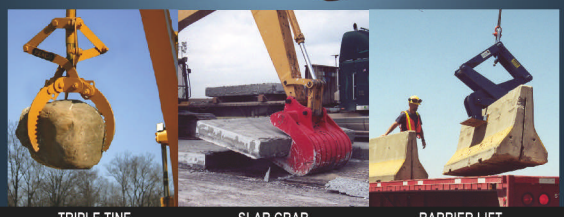

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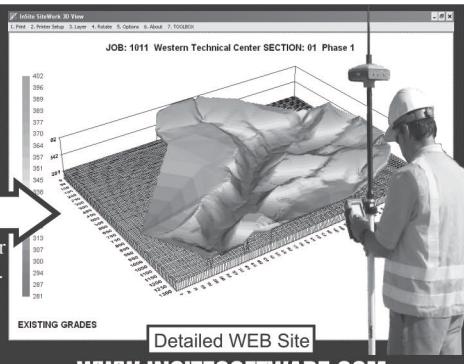

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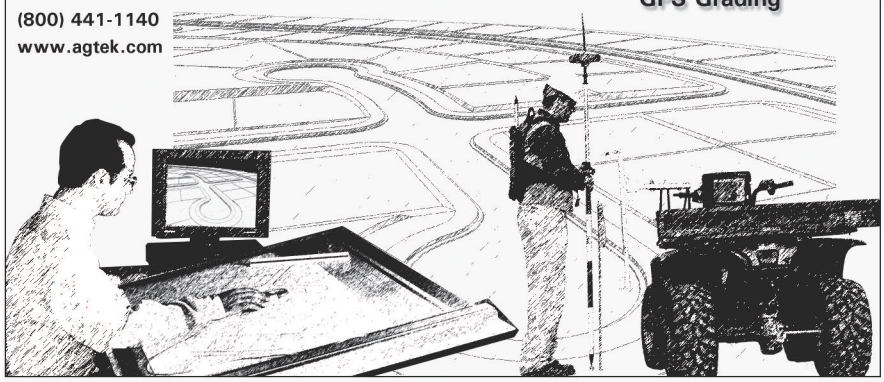

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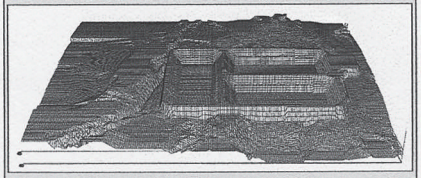

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By KEITH HADDOCK, Contributing Editor

Thew Steam Shovel

Captain Thew's unique steam shovel was America's first fully revolving excavator of any type



Thew shovel works on street job in Cleveland.

Captain Richard Thew is credited with building America's first fully revolving shovel and, like most inventions, it originated from an idea to serve a specific need. Back in the 1890s, Thew, captain of an ore-carrying boat on the Great Lakes, often encountered the problem of handling iron ore once it was deposited on the docks. At that time, such work was done with "railroad-type" steam shovels that traveled on railroad tracks. They were heavy, cumbersome, and could only swing their booms from side to side in a half-circle. Much hand work was required to clean areas beyond the shovel's reach and also to frequently reposition the railroad tracks.

Captain Thew studied these problems of ore handling and conceived a unique machine that would overcome the former difficulties and restrictions. With the help of H.H. Harris, an experienced shovel designer, Thew built his first machine at the Variety Iron Works in Cleveland in 1895. His machine was a fully revolving steam excavator with a 5/8-cubic-yard shovel attachment that could swing in a full circle, the first with this capability built in America. To add even more flexibility, he mounted the machine on four steel traction wheels, which could steer and propel itself without the need for labor-intensive rail tracks. Now able to travel without restriction, the shovel was able to perform any loading or cleanup work over the entire dock property, doing away with most of the hand labor.

The Thew shovel also boasted a unique horizontal crowding or thrusting motion that remains unique to this day. Instead of mounting the bucket arm so that it pivoted on a shipper shaft attached to the mid-point of the boom, the back end of the arm was pivoted to a steam-driven carriage running in a horizontal frame. This arrangement gave the machine superior clean-up capabilities as the shovel bucket could travel a greater horizontal distance at ground level than a conventional shovel.

With his machine perfected, Thew began to draw interest from other Cleveland shipping companies in the use of his shovel on a contract basis. This led to the sale of the first machine and, as more companies eyed its success, several more orders came in. As a result of increased sales, the Thew Automatic Shovel Co. was incorporated in 1899 at Lorain, Ohio.

The Thew company expanded its line of shovels covering all popular sizes up to 1¾ yards and, by 1912, reached the No. 3 position in excavator sales in the United States. It is credited with producing one of the earliest gasoline shovels in 1914, and supplying many machines to the armed forces in World War I. The machines also found their way into mines, brick plants, and all types of construction work.

In 1924, the Thew line of products was completely redesigned and the new machines were identified by the trademark "Lorain" after the town where they were built. In 1964, sales declined and Thew became the Thew-Lorain Division of Koehring Co. Today, the remnants of Koehring and Lorain can be found under Terex Corp., which acquired the division in 1987.

You can read more about the evolution of construction equipment in Keith Haddock's latest book release, an updated version of his fully illustrated Earthmover Encyclopedia due in bookstores Spring 2007. Also, consider a membership in the Historical Construction Equipment Association, www.hcea.net. Be sure to visit Construction Equipment.com for past Iron Works features.


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