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The Changing Landscape

By Dick Brannigan, CEM, 2008-2009 National President

I won’t mention my age (although the photo probably gives me away), but I remember slower days when it was big news when a manufacturer changed an equipment model hoping to get a leg up on competition. A manufacturer’s change to a planetary transmission, adding a torque converter or hydraulic controls would be worthy of a press release.

This news was typically followed by discussions in the sales, service and parts departments of the dealership on the challenges of training and support for the new product. Soon the news would spread to the end users and those same discussions would be repeated in each of the end user’s departments. What would each change in specifications and technology do for the operator and productivity? By today’s standards, those discussions and the details they covered seem almost quaint.

Fast forward to today’s equipment introductions and the subsequent discussions about the sophistication of the ECM information, CANbus technology and interfacing with existing equipment management systems. How can we export the equipment health information and integrate it with our enterprise system software and, if so, what hardware/software must I purchase? What Tier level is the engine and what implications does that have to my emissions footprint? What percent bio-diesel can I run in it? Can the on-board computer machine condition codes be relayed automatically to my service department to generate a work order? How many I/Os does the machine/communication software give me, and will it truly enable me to accurately judge the cycle times and yardage moved? On and on the questioning goes, adding to the complexity of the equipment purchase and its subsequent use, care and custody.

When I came over to the contracting side of the business a few years ago as a fleet manager, I quickly learned that managing a fleet involves a great deal more than meets the eye. After studying the wide range of issues and problems facing the fleet operations department, it became evident that I needed continuing education.

Fortunately a friend, who is also a fleet manager, invited me to attend an AEMP national conference. The rest, as they say, is history.

After joining AEMP, undertaking the Certified Equipment Manager exam and attending the conferences, I found not only the vehicle for my continuing education but also a program that would enable all of our fleet department managers to learn and grow. Now, with three additional managers having obtained their CEM, the application and practice of modern fleet management principles becomes the norm.

I welcome you to join AEMP and trust that the educational and networking opportunities it provides will help you lead your fleet departments to world-class status.

Dick Brannigan
President, AEMP
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2008 Fleet Masters Awards Winners

The 2008 Fleet Masters winners were honored at a luncheon during the 26th Annual Management Conference & Annual Meeting in Las Vegas in March. Kokosing Construction of Fredericktown, Ohio, won the Fleet Masters Award for private fleets, and the Virginia Department of Transportation won for public fleets. William Burgett accepted the award for Kokosing and Erle Potter, CEM, accepted for VDOT. VDOT also won a Fleet Masters Award in 2004.

Finalists for the Fifth Annual Fleet Masters Awards also included Mike Bates, CEM, of Cajun Constructors in Baton Rouge, La., in the private fleet category. Public fleet finalists included Pete Scarafioti, CEM, the City of Mesa, Ariz., and Mike Brennan, CEM, Manatee County, Fla.

Fleet Masters are recognized for their practices in the areas of human relations, vendor relations, asset management, maintenance management and technology. AEMP annually recognizes industry leaders for their outstanding contributions to the art and science of fleet asset management.

The Fleet Masters Award was created with Construction Equipment to honor equipment management professionals who excel in meeting the unique challenges inherent in delivering cost-effective management of mixed fleets of on-road and off-road equipment. Nominations are solicited from the entire industry, and nominees and nominators do not have to be members of AEMP to participate. There is no obligation for entering and no entry fee.

The Awards are sponsored by John Deere, Castrol, Caterpillar, Construction Equipmen, Komatsu, Manitowoc, QUALCOMM and Volvo Construction Equipment.

It’s not too early to consider entering the 2009 Fleet Masters competition. Review the nomination form available at www.aemp.org, and see what it takes to become a Fleet Master. Start working on it today.
In February, AEMP and the AEMP Foundation announced the winners of its Technician of the Year Awards, one private-industry employee and one from the public sector, who were then honored at a breakfast during the 26th Annual Management Conference & Annual Meeting in Las Vegas.

The public fleet Technician of the Year is Craig Donor of the Virginia Department of Transportation, a 19-year industry veteran. Donor works at a VDOT facility in Fredricksburg, and was named 2008 Technician of the Year for his nine-shop district. He was part of a committee that developed and introduced laptop diagnostic equipment to VDOT repair shops statewide, and was part of the pilot FleetCross website, for which he is now an instructor and administrator.

Donor was on a committee to design a new piece of equipment that is now undergoing field testing as a prototype, and he thought of a modification to field services trucks that free the bed of the truck for supplies and spare parts, a change being implemented statewide. He was selected to a District Mentor Program, holds ASE Masters and FAA certifications, and is also a certified welder and FEMA-certified emergency manager.

The private fleet Technician of the Year is Brian Ganson of George J. Igel & Company, Inc., Columbus, Ohio. In his 14 years in the profession, Ganson has become a highly respected member of a team of 20, even as the youngest of his company’s field mechanics. He is on the firm’s safety committee, and coordinated the purchase and installation of a GPS fleet monitoring system, suggesting system modifications to the vendor that were incorporated and were to be introduced at CONEXPO-CON/AGG 2008.

The AEMP Technician of the Year Award, established in 1989, is sponsored annually by the AEMP Foundation to spotlight the increasingly complex skill sets required of today’s professional technician and to raise awareness of the critical shortage of technicians that now exists. Award winners are selected based on professionalism, technical skills, innovative troubleshooting and diagnostics, and for exemplary contributions to the equipment technician profession.

Nominations are solicited from the entire industry, and nominees and nominators do not have to be members of AEMP to participate. There is no obligation for entering and no entry fee.

The AEMP Technician of the Year Award is sponsored by John Deere and the AEMP Foundation. The awards luncheon was sponsored by QUALCOMM.

The AEMP Foundation funds technician scholarships for students attending accredited two-year technical education programs in pursuit of careers as equipment technicians. Scholarship funds cover tuition and books for recipients.
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These members of the 2007 class of Certified Equipment Managers were recognized during the annual meeting.

Rawlings Feted as Member of the Year

Marilyn Rawlings, CEM, was named AEMP Member of the Year, an award that recognizes outstanding service to AEMP by an individual through active participation in and contribution of new ideas, practices or innovation in maintenance or management of heavy-duty equipment.

Marilyn was elected vice president in 2003 and served as president-elect in 2005-2006 and president in 2006-2007. She holds a B.S. in education from Taylor University and completed work for an M.S. in guidance and counseling at Oakland University and Eastern Michigan University.
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QUALCOMM Is Associate of the Year

QUALCOMM was given the Associate of the Year honors for its efforts that have significantly enhanced or promoted AEMP.

With technology advancing, it has been important to have a highly respected company in the industry keeping AEMP aware of changes that will impact the equipment management profession. QUALCOMM representatives are an asset to AEMP committees, educational programs, members, and the entire industry. QUALCOMM has been an important contributor to the AEMP Foundation, and provides session speakers at AEMP conferences, including the CEM Institute.

Rebecca Brown receives the Associate of the Year Award on behalf of QUALCOMM, which has supported AEMP in a wide range of programs for the past four years.

McFadyen Awarded Hawkins Recognition

The Richard Hawkins Award was presented to Will McFadyen of McFadyen & Associates. The award is given to the outstanding individual associate member who best exemplifies the dedication of Richard Hawkins, who set the standard for service and contributions to the mission and goals of AEMP.

McFadyen was the driving force behind the new AEMP web site and spent many hours traveling back and forth to the AEMP headquarters to work with staff in the development of the site. He is respected among end-user members for the software his company has created and is developing, and he has demonstrated a willingness to work with other associate members in developing programming that benefit members.
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Technology was very much on the minds of attendees of AEMP’s 26th annual conference.

The AEMP Foundation presented seven scholarships to winners of the first Construction Challenge, sponsored by AEM. Nearly 100 teams competed in the competition. The Foundation continues to grow and provide scholarships to individuals wishing to enter the technician profession. The Foundation recently raised more than $30,000 from its second annual online auction sponsored by IronPlanet and is seeking contributions from anyone wishing to sponsor a technician for a two-year program. The cost is $2,500. The Foundation hopes to raise enough funds to annually award 200 scholarships.

Best practices education is an integral part of any AEMP conference. Here, several asset managers from Kokosing Construction join others to learn about the challenges of changes in emissions standards.

The 16-hour CEM Institute enjoyed record attendance at the conference as CEM is growing in importance and stature in the industry. In addition to the Institute, more than 100 asset managers took a field test for the all-new CEM exam, which will be unveiled in October at the 2nd annual Asset Management Symposium.

Dave Gorski, CEM, of K-5 Construction; Andy Murad, CEM, of Spearin Preston Burrows; and Dr. Matt DiIorio discuss the finer points of asset management. A highlight of any AEMP conference is networking with peers.

Technology was very much on the minds of attendees of AEMP’s 26th annual conference.
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AEMP defines benchmarking as “a tool that can be used by any company to measure where a company is compared to its competition in the industry.” It can be used by any company to facilitate continuous improvement in its products or services. Those improvements help maintain and increase the customer base, which is essential to the life and growth of a business.

So why don’t more fleet managers benchmark?

“Truth is that many fleet managers are afraid to benchmark because they’re afraid it will make them look bad,” says Marilyn Rawlings, CEM, fleet manager for Lee County (Fla.) 1,800 pieces of equipment.

With that attitude often comes another obstacle: Many companies have sacred cows they don’t want changed—things like always doing things one way or dealing with certain suppliers because they like them best.

“What those fleet professionals forget is that sacred cows make the best hamburger,” says Rawlings. “You have to look at everything you do.”

**Benchmarking by the numbers**

Benchmarking is a process that allows a company to identify best practices used by organizations anywhere in the world and apply them in their own operations. It is a multi-step procedure that requires the fleet professional to define objectives, measure performance, collect data, and measure the organization’s performance against its peers and against the industry.

Following is a step-by-step approach:

**Steps one and two** require defining objectives and measuring performance. Todd Perrine, CEM, at Leslie Equipment, includes seven factors in these steps.

- **Suitability**—This takes into account performance attributes, such as the extent of use. A performance measure, for example, would be utilization of the equipment in miles or hours.
- **Availability**—Here a performance attribute would be downtime, and a performance measure would be the percentage of units that are out of service per day.
- **Reliability**—The performance attribute would encompass the number of breakdowns; performance measure would be hours and miles per breakdown.
- **Safety**—This requires compiling the number of accidents over a certain period of time and comparing that number with millions of miles driven.
- **Economy**—The performance attributes here include capital, as well as operating and maintenance costs. The performance measure is cost per mile or hour.

Companies that put forth the effort and commitment to benchmarking report significant increases in productivity

*By G. C. Skipper*
Environmental impact—If cleaning up the environment is an objective, the performance attribute would be the fuel efficiency of the unit. The performance measure would be miles or hours per gallon.

Customer satisfaction—The performance attribute would be satisfied customers. The performance measure would be the percentage of customers who are satisfied.

Step three requires the collection of data from a variety of sources, including historical performance data, industry data, published standards, information from peer organizations, contract performance terms, and vendor prices.

Step four is measuring performance. Determining maintenance and repair costs, for example, would include labor costs. Labor costs, in turn, would encompass worker efficiency and productivity, salaries, and fringe benefits, as well as indirect maintenance costs.

Step five is evaluating conditions and practices. As part of this step, there are certain factors that drive worker efficiency and productivity. Composition of the fleet is one of them. The age and condition of fleet equipment is another, as are fleet utilization and operation, staffing levels, facilities and equipment, and maintenance management and operating practices.

Steps six and seven require surveying your peers, and comparing conditions and practices.

Step eight is the implementation of improvement strategies. This can be done through time reporting, block time assignments, quality assurance, time and task standards, reporting defects, and the scheduling of work.

“What those fleet professionals forget, is that sacred cows make the best hamburger. You have to look at everything you do.”

Marilyn Rawlings, CEM, fleet manager for Lee County (Fla.)

Benchmarking availability would include performance attributes, such as downtime, and a performance measure would be the percentage of units that are out of service per day.
"You have to have benchmarking to establish your trends, your activities, and whether or not you need the volume of support people or expenditures you’re running."

Robert Andrade, CEM, vice president, equipment management, Parsons

"Knowing that, I can renegotiate what I’m paying," she says. "It’s all part of the big picture: Everything is interrelated."

Rawlings uses several techniques for measuring her operation against the competition and the industry. One is an annual survey.

For that, she equips those who actually conduct the survey with a list of questions for fleet professionals in both the public and private sectors. Targeting the four surrounding counties, they place telephone calls to government fleets to collect data, such as how much they mark up their parts and how much they bill an hour.

"I also have them call the local car dealerships and other shops in the private sector to find out, for example, what their billable rates are for working on a tractor," says Rawlings. "They won’t talk about their parts markup, but a lot of them will share rate information because I’m one of their major customers. If they ask why I want to know their billable rates, I tell them it’s because I don’t pay retail."

If a dealership charges $84 an hour, and Rawlings is paying $84 an hour, she knows she has some work to do.

"If a job takes two hours and a technician is spending 3.5 hours on the job, they’re costing me money," she says. "I either need to take that repair to an outside vendor or spend some money training that technician to perform the repair quicker."

In some ways, benchmarking a government fleet doesn’t include the same challenges as a fleet in the private sector.

"I think, as a government fleet, we have an advantage in benchmarking and I think we’re better at it than the private sector," says Rawlings. "Private fleets have to be very careful about what they share. They don’t want their competition to know it costs them $70 an hour or $90 an hour to run their fleets. A contractor can’t call another company to find out their trade secrets, but they can find out if it’s cheaper for them to do the repairs in-house or send it out. If it’s costing a fleet manager $90 an hour and he can send the job to Acme Tractor and have it done for $70 an hour, he has to look at that pretty seriously."

Many fleet professionals won’t outsource jobs.

"My feeling is, if somebody else can do the work cheaper than we can, I would be foolish not to take advantage of that," she says. However, the shop that does the outsourced work must provide quality service.
“If I outsource a job, I hold their feet to the fire in terms of turn-around,” says Rawlings. “The point is benchmarking takes the guess work out of these types of management decisions.”

**A private application**

In the private sector, Robert Andrade, CEM, vice president, equipment management, for Parsons, uses benchmarking to control costs, optimize the size of the work force, and evaluate overhead.

“You have to have benchmarking to establish your trends, your activities, and whether or not you need the volume of support people or expenditures you’re running,” he says. “A lot of factors must be considered—cost of maintenance, direct and indirect overhead and labor costs, for example. You have to track and benchmark those factors monthly, quarterly or annually. By tracking these kinds of costs, you can figure out if you’re spending too much on your fleet or not spending enough.”

Parsons maintains a fleet of approximately 1,100 units that Andrade characterizes as a high-utilization fleet.

“The core fleet changes along with our business activity,” he says. “Since we do all types of construction, our fleet can change from year to year, depending on our utilization and project requirements. It might be road-building equipment one year and something else the next. If I can’t schedule the equipment, I sell it.”

Andrade doesn’t benchmark his operation against other industries.

“I don’t bother,” he says. “My business plan, company and philosophy will be different. I may pay attention to what others are doing, but I don’t give it a lot of weight. It’s more curiosity about how they manage their businesses.”

Because no two companies are alike, Andrade says benchmarking software is difficult to find.

“You can’t find good off-the-shelf software for benchmarking, equipment maintenance tracking, or cost of ownership,” he says. “There are just too many variables.”

**Implement and repeat**

Once benchmarks have been identified, put them in writing. This provides the basis for implementation.

Then, train the employees who must use it. Once that’s done and the practice is in place, compare it with the old procedure or data to verify the practice has been successfully applied.

And when all the steps are completed, start the process again.

“Benchmarking is a management tool, not a management objective,” says Perrine. “When using it, don’t confuse symptoms with causes, and be sure you’re comparing apples to apples. And always remember better information will lead to better benchmarking.”

Every business entity encompasses variables and complexities; however, those companies that do put forth the effort and commitment to benchmarking report significant increases in productivity. Still, if benchmarking is to be successful, top level management must commit time, money and people to the effort. That support is critical. **EM**

**What Can You Benchmark?**

Todd Perrine, CEM and vice president of product support at Leslie Equipment, a John Deere dealership, suggests fleet professionals benchmark any of the following to improve operations:

- Accident management
- Customer retention
- Customer satisfaction
- Downtime
- Equipment lifecycle costs
- Fleet costs
- Fleet operating practices
- Fuel usage and rates
- Glass replacement
- In-house vs. outsourcing costs
- Insurance
- Internal performance
- Labor rates
- Maintenance costs
- Miles per gallon
- Operating cost per mile
- Policies
- Safety programs
- Shop rates
- Unscheduled repairs
- Vehicle replacement policies
- Vendor vs. vendor
- Warranty costs
If you want a clear picture of what’s in store for equipment managers in the coming years, consider the Titanic. That’s how Leigh Dennis, CEM, heavy equipment service manager at Fowler Contracting in Raleigh, N.C., visualizes the future’s biggest challenge—emissions management.

“The Titanic collection of diesel-powered industries is steaming towards the emissions iceberg,” he says. “We can see the tip approaching fast, but many don’t know the full range of the legal and economic implications that hide beneath the surface. Some fleet managers are waiting for someone to tell them what they have to do. Those who are prepared will survive. Those who are not will probably go down with the ship.”

According to Dennis, fleet owners and managers must think, plan, and act “green” now, or a day will come when a percentage of off-road equipment will be required to have emissions-compliant power. It’s likely non-compliant companies won’t be allowed to bid on green projects.

What complicates the picture is that the level of attention compliance receives depends on the fleet’s location; whether the equipment operates in an EPA-designated non-attainment county, i.e. an area with heavy industry or heavy traffic that fails an eight-hour pollution detection test; the level of public awareness in the area; and the amount of clout given the local or regional environmental authority.

Fowler’s fleet, for example, operates in the sixth fastest growing state in terms of population.

“In our case, the North Carolina Department of Environment and Natural Resources Division of Air Quality has not committed to providing anything more than a verbal confirmation of what the Environmental Protection Agency (EPA) requires,” he says. “Right now, I’m sure they have their hands full with one of the worst droughts on record. When attention shifts toward emissions-compliance deadlines, that’s when some folks in this state will begin to scramble for solutions.”

Similar authorities exist in every state but the power they wield varies greatly, ranging from the California Air Resources Board (CARB), which has unprecedented authority in California, to regional organizations made up of state environmental authorities, business organizations and trade industries.

In many areas, state EPA members have more pressing issues, and non-road diesel emissions regulations are on a back burner—at least for the moment. Often such groups, only assist regulatory authorities with diesel emissions laws.

Information deficits

While information about on-road diesel emissions regulations is available on environmental agency websites, off-road information is difficult to find. With 352 non-road pieces, of which 99 percent are diesel-powered, Fowler needs the information.

“I have to have questions answered now because our mixed fleet has to be in compliance,” says Dennis. “Down the road, we’re going to have someone out there say, 'I need proof that your fleet is X-percent green.' Plus, there’s a public image to maintain.”
Companies that require a contractor to prove the company is green likely either have money, i.e. federal subsidies, tied to compliance or they are being pressured by their insurance company.

“No one wants to be hit by an environmental law suit,” says Dennis. “To reduce that risk, all your subcontractors may have to be green on certain projects.”

Fowler is dealing with the inevitable by being proactive. They have implemented a fleet management program that is building momentum and upper management has made a strong commitment to make resources available to continue the program.

“We’ve already cut our fleet idling time significantly with our new Earthwave FleetWatcher asset management system,” says Dennis.

In addition, the company’s equipment management team has identified sources of biodiesel and has begun to study some of the exhaust particulate filters and catalyst equipment on the market.

**Solutions sources**

In the search for solutions, applying for state grants specifically earmarked for reducing mobile emissions can be a good resource. But, it’s a long process.

“I’m currently gathering the information required to write a grant application,” says Dennis. “If it proves worthwhile, we’ll submit it before the December 31, 2008, deadline for consideration next year. You have to do the research and put a plan together. It’s a long process with a lot of strings attached to it that could involve such things as providing reconciliation reports or matching funds.”

Fowler’s fleet is about 70 percent green because of fleet expansion that brought in equipment with Tier 2 and 3 engines. Future plans on greening the fleet, will depend on the government, the market and the industry.

“Our state government is not pursuing the issue of non-road diesel emissions at this time, so we’re still in the planning stages,” he says.

The only way to survive in a competitive market is if the emissions laws are applied equally to everyone, says Dennis. Another factor will be the availability of refit parts, replacement equipment and funds.

“The trickle-down effect of federal highway funding, which can depend on a state’s level of emissions compliance, is another consideration,” he says. “However, it can be a double-edged sword. On one side, more highway money means more growth and development. On the other side, contract owners may have to require contractors to prove they are up to date on fleet emissions compliance in order to get the work.”

**A Proactive Approach**

Leigh Dennis, CEM, has his work cut out for him as a member of the AEMP Emissions Task Force. He is charged with identifying state environmental authorities to provide information on the diesel emissions regulations they oversee.

Another group that can be very involved in the issue are the state departments of transportation (DOT). They are often the driving force for non-road diesel emissions compliance because they have the most to lose—highway funding.

“The U.S. Environmental Protection Agency cannot efficiently enforce mobile emissions compliance in the field, but it can cease the flow of federal funding to important state projects,” says Dennis. “That’s the last thing state DOTs need. Many state environmental authorities are under-funded and over-burdened with trying to regulate and enforce emissions compliance in other areas where they have true governance; however, they still have a responsibility to make off-road diesel emissions compliance information available to their constituents.”

That information must cover agriculture, marine, and stationary equipment, as well as construction equipment.

“They just don’t realize how many diesel engines there are,” says Dennis. “Left to their own devices, state authorities can go crazy and just start making rules that prove too costly and even ridiculous.”

A case in point is Houston, Texas.

“The environmental authority attempted to prohibit the use of diesel engines for much of the day from April to October,” says Dennis. “They tried it, but the results were potentially so devastating, the bright idea went dark quickly and with the help of industry stakeholders, an equitable solution was found.”

These are the situations Dennis and the AEMP Task Force are working to avoid.

“You have to be active in the whole process,” says Dennis. “Otherwise, you can be regulated out of business. I want to keep that from happening.”
It's no secret history repeats itself, but that doesn't have to be the case when it comes to equipment downtime. One sure way to put a stop to recurring failures before they become catastrophic is by compiling and using the accumulative data found in preventive maintenance (PM) histories.

At Cajun Equipment Services, President Michael Bates uses PM histories to protect his 145-unit fleet by preventing failures through high-quality maintenance practices, protecting the resale value of those assets, and avoiding premature equipment failure.

“We look for recurring failures or leading indicators of major failures so we can schedule the machine out of service rather than waiting for the machine to schedule itself out of service,” he says.

According to Bates, the key to preventing premature equipment failure is the shop technician.

“A lot of companies use oil and other fluid analysis,” he says. “We don’t, unless it’s required to maintain the OEM warranty. We rely on the technician to spot leading indicators visually, indicators such as the condition of the fluid. Technicians look for water and dirt contamination, metal, and discoloration. If any one indicator throws up a red flag, we go to the next level to find out what the specific contaminant is and how it got there. Is it a seal failure? Do we have someone in the field putting contaminated fluids in the machine? Is there equipment with a fluid leak at a jobsite that is being topped off incorrectly?”

Because Bates only uses oil and other fluid analysis to maintain warranty, the company doesn’t track or store that data.

“The lab keeps all our records,” he says. “We take the oil sample and send it to the lab; the lab sends the results to our dealer to maintain the warranty. We don’t track it.

“We have an advantage over some other companies in that, typically, no one touches our equipment but us and the dealer. In both cases, the technicians are skilled enough to recognize a leading indicator and take corrective action.”

The basic principles of PM are the same throughout the fleet; although, there is a slight difference in how PM is done when it comes to machine type. For example, says Bates, PM for a wheel loader is going to be different from a crawler dozer.

“You have tracks to maintain on dozers or excavators that you don’t have on a wheel loader, so PM will vary somewhat,” he says. “But the
principles of using a PM schedule to avoid catastrophic failure are the same.”

Accumulating PM history data is just the first step.

“You can have a truck load of data, but if you don’t interpret and apply your data, and make it part of your real-world PM program, it’s useless,” says Bates. “It’s just another function that burns up time and energy. We keep historical data on our machines from cradle to grave, and we keep it by categories that include type of machine and type of failure.”

Historical data allows the company to track the failures that can occur at specific intervals.

“That gives us a crystal ball,” says Bates. “For example, we know that out of 25 wheel loaders that had the same number of hours on them last year, we had to replace two torque converters. Of course, you can always have an unexpected failure, but as a rule, the more data you retain over a longer period of time the better you can identify trends and manage the assets.”

No time for failure

Chris Ryan, equipment vice president for Boh Bros. Construction, relies on engine oil analysis and emphasizes the importance of keeping fluids clean to ward off equipment failures.

“Failure analysis is after the fact,” he says. “What we do is have regular inspections, daily reports from the operators, oil analysis, and service reports. It’s the combination of these, not any one of them, that we rely on. We use each one to validate the others so we don’t incur a failure. The operative word is failure. If a failure occurs, it’s a failure within the system, not simply a failure of a component.”

According to Ryan, the cleanliness of fluids can never be taken for granted.

“We try our best to keep all fluids clean: fuel, hydraulic oil and engine oil,” he says. “We have service trucks with reels on them, and we have reels in our shop to make certain the product is delivered in good condition. One manufacturer of paving equipment requires you to put hydraulic oil into a separate tank, and hand-pump it through a filter and into the reservoir. I think that speaks to the fact that even clean oil isn’t necessarily clean enough.”

For the 1,600 to 1,700 units in the Boh Bros. fleet, Ryan tracks and analyzes trends and performs stereograph analysis on engines and hydraulic systems.

“We also do particulate counts on hydraulic systems,” he says. “Pressures and flows are done periodically. As you get wear on hydraulic pumps, they start to trend downward, and you can see it coming. You can schedule something like that for a component replacement.”

Ryan says he’s knows a lot of good people who swear by component replacement based on time in service, but he has found the operational variables are so great that he can’t justify doing that for all equipment across the board.

The data Boh Bros. collects is organized in three categories. Category one is for safety issues that must be handled immediately: The machine is shut down. Category two is for a failure that could lead to other failures: The machine continues to operate, but is monitored. Category three is cosmetic.

“Cracked glass, a dented panel, or anything that’s not going to interfere with the function or safety of

Mike St. Clair, sales representative for a Caterpillar dealer in Cincinnati, Ohio, checks out an ultrasound device that measures metal thickness on paver floor plates and dozer blades used by Barrett Paving Materials. By measuring the metal thickness, accelerated wear can be identified and adjustments made according to the wear pattern.
a machine is cosmetic,” says Ryan. “We put the machine in line for attention, but often we wait until the next time it comes in to the shop to do the repairs.”

Machine type, application and other variables are used to determine maintenance schedules.

“Lifting and over-the-road equipment maintenance is compelled by law,” he says. “Certain things, such as brake adjustments, tire treads on trucks, and oil leaks, have to be taken care of or the unit will be put out of service. On average, our rolling stock is brought through the shop every 60 days for service inspections and corrective action. Our cranes are inspected daily by the operator; an inspection by the equipment department is made at least every 60 days for functional and safety issues, such as hoist cables, load lines and booms.”

For basic dirt equipment, Ryan relies on daily service and inspection by the operator, and periodic service by the company’s service trucks.

**First line of defense**

Ron Hutchinson, CEM, at Barrett Paving Materials, is responsible for a fleet of 200 units. Oil analysis is the bedrock of his PM program and the first line of defense against equipment downtime.

“Every time we change the oil in a machine, we take a sample,” says Hutchinson. “A lot of times, we sample oil even if the equipment is not due for service. We’ll get a reading and then sample again at the 250-hour service check to monitor oil life.”

If any repeat failures show up, Hutchinson takes a closer look to try to determine if the failure is due to operator errors, application-related issues or equipment problems, or whether a better machine might be needed to prevent that particular type of failure.

But, says Hutchinson, oil analysis is just the start.

“The more data you have, the better data you have,” he says. “With a paver, for instance, you need two or three years of data to know how many tons of mix went through the machine and what type of mix was used. Then you can see what wear factor is caused by what type and tons of material placed.”

Hutchinson says record keeping, regardless of how it’s done, is essential.

“You have to keep your records all in one place and not have them scattered around in different files,” he says. “I keep all the data on my computer so I can monitor it.”

Also, he says, you need a mechanism to spot minor repairs. Daily check lists should have a place for “required repairs.”

**Overall Sample Ratings**

<table>
<thead>
<tr>
<th>Company</th>
<th>Normal</th>
<th>Abnormal</th>
<th>Severe</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sites</td>
<td>1284 (58%)</td>
<td>894 (40%)</td>
<td>51 (2%)</td>
<td>2229 (100%)</td>
</tr>
</tbody>
</table>

**Severe Samples Problem Category Breakdown**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>17</td>
<td>33%</td>
</tr>
<tr>
<td>Wear</td>
<td>14</td>
<td>27%</td>
</tr>
<tr>
<td>Dirt</td>
<td>11</td>
<td>22%</td>
</tr>
<tr>
<td>Soot</td>
<td>7</td>
<td>14%</td>
</tr>
<tr>
<td>Visual Metal</td>
<td>2</td>
<td>4%</td>
</tr>
</tbody>
</table>

This sample rating for CJ Miller graphically depicts the lab test results of oil samples. Of the 2,229 samples taken, test results ranged from 58 percent normal to 2 percent rated severe.
“The key is communication,” he says. “You have to make sure the shop is notified by someone in the field when a machine needs service. That will take care of small repairs while they are small instead of letting them go until a catastrophic failure happens.”

**Oil analysis and fuel management**

Dale Warner, CEM, with CJ Miller, manages about a thousand pieces of equipment. Warner also uses PM histories to stop recurring failures.

Warner uses PM histories focused on two factors—oil analysis and fuel management.

“The one thing we don’t do is think if one machine ran for 3,000 hours, another one will do the same before it blows up,” he says. “You can’t measure workload in hours. If everything were equal, maybe, but when a piece of equipment moves from one job to another, conditions and applications change. One time you can be working in rock; another time you’re working in mud: In those two applications, the gallons of fuel used and the work load vary. Because of that, hours can’t really predict failure. Everything depends on the history of a particular unit and its individual work load.”

Warner bases PM scheduling on fuel consumption, and says, while the PM for trucks is a little different than dozers, the schedules are the same.

“One type of unit runs longer than the other,” he says. “For example, we have articulated trucks running up to 700 hours on an oil change. Other trucks do 300 or 400 hours because of where they’re hauling.”

The fleet’s oil analysis data is captured and stored by the laboratory that analyzes the oil samples. “The data is accessible to us online whenever we need it,” he says. “We can also get a hard copy from the lab if we want it.”

Fuel management is handled internally, and Warner says the company is in the process of installing an automatic fuel-tracking system with about 80 percent of the fleet already converted.

“The system records when fuel was stored in the fuel truck and when it was put into a machine,” he says.

When the fuel trucks return to the yard, a wireless system sends the information to the computer, which reports gallons of fuel used, hours operated, time, date, and job number.

“The Opak USA fuel tracking system we use has totally automated data retrieval,” says Warner. “The equipment has a sender on it, and the fuel nozzle has the receiver. When the nozzle goes into the tank, all the data is recorded. We also use the system to measure equipment utilization.”

To get the biggest bang from using PM histories to stop recurring failures have a system in place that allows the procedure to work.

“It all starts with people,” says Warner. “You have to have people who really care about what they’re doing and people who pay attention to what they’re doing. You also have to use quality products and have the support from top management to get the job done.”

All four fleet managers agree that while philosophies, techniques and technologies may differ when it comes to using PM histories to stop machine failures, success requires the absolute commitment of top management.
Lab analysis of fluid samples helps reduce equipment downtime, increase productivity, decrease maintenance time and cost, and extend equipment life.

By G. C. Skipper

Laboratory analysis of fluids such as engine oil, fuel, coolant and hydraulic fluid, can be a very powerful tool—provided you know how to use it.

According to Diego Navarro, service marketing manager with John Deere Construction and Forestry Division, the benefits of sending oil samples for testing are numerous. Analysis can detect machine wear, aging of the oil and even whether you’re using the correct fluid. It can also detect the presence of mixed fluids, which can be very dangerous.

Another function of oil analysis is to help fleet managers understand the work environment of the machine.

“If a machine works in water, you’ll see more humidity,” says Navarro. “If it works in Florida, you’ll see sodium in the sample. If the machine is working a jobsite in Illinois, you’ll find aluminum.”

Oil analysis can also recognize if maintenance is adequate.

Mark Minges, COO for Polaris Laboratories, says oil analysis gives fleet managers advanced notice of pending failure.

“It allows you to schedule maintenance and avoid unscheduled downtime,” he says.

Testing oil samples can also identify contamination and the possible sources for it, as well as providing other information that is vital to equipment management.

When analyzing coolants, says Minges, you also monitor for adequate metal protection and prepare for extreme temperature variations.

“It ensures the fleet is ready for winter and summer,” he says.

Fuel analysis

Fuel analysis has three major benefits. It monitors:

- Contamination, such as bacteria, fungi and mold, which can plug fuel filters and significantly shorten fuel filter life
- Ignition quality. For instance, the Celine index, distillation and flash point determine how efficient the combustion process is, and whether or not it’s able to provide sufficient power to the engine
- Lubricity.

“The EPA now requires the use of ultra-low-sulfur diesel fuel (ULSD), but the refining process for low-sulfur fuel can reduce...
lubricity, which is the oil’s ability to lubricate fuel injections,” says Minges. “By measuring lubricity, you can determine how much lubricity agent needs to be added. But before you add anything to the oil, you should discuss it with your oil supplier.”

Fleet professionals are becoming increasingly aware of the benefits of oil and fuel cleanliness. “We’re seeing more interest in fluid cleanliness, wear debris analysis and varnish detection,” says Minges. “People are starting to understand contamination and its effects on equipment performance. They are also realizing the value of doing analytical ferrography or micropatch testing in conjunction with ICP. Since ICP only detects particles of a certain size, ferrography will identify larger particles, as well as help determine the possible sources.”

Another sign fleet managers are beginning to associate fluid cleanliness with good equipment performance is evident in the significant increase in requests for particle counts on fuels. Requests for biodiesel testing are also becoming more common.

“Because there are no manufacturing standards for biodiesel, fleet managers should always test to determine product quality,” says Minges. “Testing for ignition quality should include measuring glycerin content; the presence of bacteria, fungi, mold and water; and cold-weather properties.”

Deere’s Navarro says biodiesel testing provides different results. “We’re going to start seeing different things now, such as metals we didn’t see before,” he says. “We may see fuel dilution, more rust and even changes in emissions because the use of biodiesel increases nitrous oxide.”

Part of the issue is the way biodiesel is processed. “Biodiesel is part acid and tends to be more corrosive toward metal,” says Navarro “That’s why we see more tin, lead and copper. Biodiesel also catches more water. It’s heavier than diesel fuel and tends to stay in suspension in the oil for longer periods of time. It’s very difficult to evaporate, so it has more time to react with the oil and cause damage.”

Although biodiesel mixes well, it can be difficult in cold weather. “Biodiesel doesn’t flow easily when it’s cold, so it clogs filters,” says Navarro. “And when biodiesel isn’t processed correctly, glycines aren’t removed. That forms gels that clog filters. There’s a process to remove the crystals, but it’s expensive.”

Ultra-low-sulfur diesel

To combat the effects of the many of the recent engine changes necessary for emissions compliance, new oils have been formulated for use with ULSD.

“ULSD is a great addition,” says Navarro. “It can help the oil survive much longer. In the past, oil changes were determined by the amount of sulfur in the fuel. Today, the manufacturer might recommend you change the oil every 500 hours, but that’s only a suggestion. You could have consumed your TBN in half the time, maybe at 250 hours.”

ULSD is designed to protect the components that are there to reduce air pollution, such as EGR valves and variable geometry turbochargers.

“They also reduce the amount of pollutants in the exhaust zone,” says Navarro. “By reducing the sulfur, you’re removing the compound that is naturally found in fuel. Therefore, ULSD needs some anti-wear additives that return the fuel to the lubricity that is required.”

EGR engines increase the amount of soot that must be suspended in the oil, and while the new CJ4 formulations are keeping up, they have a lower starting base number.

“That can require decreasing drain intervals,” says Minges. “When switching to CJ4 oil, it’s a good idea to test to make sure the same intervals apply.”
How-to advice

Although fluid analysis has become a routine part of many fleet maintenance programs, Mark Stamp, Luber-Finer product manager recommends fleet owners who are venturing into it for the first time should follow these simple steps when taking a sample:

- Bring the equipment to operating temperature
- Obtain a sample, for instance, from the oil reservoir
- Complete the sample information form included with the sample kit
- Ship the sample to the laboratory.

The laboratory will perform a battery of tests on the sample based on the component type.

During oil analysis, tests detect wear metals, such as sodium, iron, copper, potassium, sulfur, silicon and lead. When coolant samples are analyzed, tests detect total dissolved solids, freeze point, appearance, ph content and other factors. Fuel analysis tests for distillation, bottom water and sediment, pour point, flash point, color, and particulate matter, among other things.

After the analysis is complete, the lab will provide a written report indicating the component’s condition.

“OEM threshold analysis has a set limit,” says Stamp. “Trend analysis of equipment or an individual component shows spikes that exceed the norm. Statistical analysis is used when an engine manufacturer says one number is abnormal and fleet statistics show a different number as abnormal. With so many indicators, gauges, testing and analysis, fleet managers can be overwhelmed.”

The Benefits of Fluid Analysis

Oil analysis
- Provides advanced notice of pending failure
- Allows you to schedule maintenance and avoid unscheduled downtime
- Identifies contamination and its possible sources
- Provides information vital to root-cause analyses

Coolant analysis
- Monitors for adequate metal protection
- Prepares for extreme temperature variations – ensures readiness for winter/summer

Fuel analysis
- Monitors contamination. Bacteria, fungi and mold can plug fuel filters and significantly shorten fuel-filter life
- Monitors ignition quality. Cetane Index, distillation and flash point determine how efficient the combustion process is, and whether or not it provides the engine sufficient power
- Monitors the oil’s ability to lubricate fuel injectors.

Source: Polaris Laboratories

“...we’re seeing more interest in fluid cleanliness, wear debris analysis and varnish detection. People are starting to understand contamination and its effects on equipment performance.”

Mark Minges, COO, Polaris Laboratories
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Once a fluid analysis program has been established, fleet managers can validate the effectiveness of the program by conducting monthly and yearly reviews. “All it takes to start is to purchase kits and sample accessories,” says Stamp. “Then establish the equipment database and an initial sample scheduling, and add or update as required. Next, review the samples in your active list and decide on corrective action from abnormal and severe sample reports. And finally, confirm maintenance was carried out and if it was sufficient to correct the problem. After all, the information is only useful if it’s put to good use.”

Lab analysis of fluid samples helps reduce equipment downtime, increasing productivity; decrease maintenance time and cost; and extend equipment life.

“Fluid analysis helps the fleet professional avoid catastrophic engine and component failure,” says Stamp. “The end result is increased profits.”

**Products**

**Polaris Laboratories**

Polaris Laboratories offers a wide range of fluid analysis for both on- and off-road vehicles. Oil analysis identifies contaminants and possible sources, among other things. Coolant analysis monitors metal protection and helps prepare vehicles for winter and summer working conditions. Here a technician prepares a fuel sample for testing. Fuel analysis monitors such factors as contamination, ignition quality, and lubricity.

For more information, visit www.polarislabs.com

**Luber-Finer**

Three types of fluid analysis are offered by Luber-Finer: OEM threshold analysis that follows OEM guidelines, trend analysis of equipment or individual components, and statistical analysis when fleet history and OEM numbers disagree on what is considered abnormal. Full information on the company’s laboratory fluid analysis and maintenance programs are available at the company’s website.

For more information, visit www.luberfiner.com

**John Deere**

John Deere Construction & Forestry Division provides fleet managers this oil analysis kit for fluid analysis programs. Once a fluid-sample is taken, it’s placed inside the appropriate container and mailed to the laboratory for analysis. Test results are available either in hard copy or online.

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