

Technical advances, increased capacities and power offer the potential to maintain tonnage while reducing costs

Making the grade: How to select the right haul trucks

By Jack L. Bowers



Modern trucks offer greater payload, performance, and fuel efficiency — plus improved cabs. A good match with the crusher and loader is the first requirement in truck selection.

The past decade has brought dramatic improvements and new choices in off-highway trucks. The producer planning to replace trucks bought more than 10 years ago can today choose from a broad range of products and features — but will have to make some

Jack Bowers is the manager of North American Aggregates Business, Caterpillar Inc.

smart decisions to maximize the value of the dollars spent.

Even if you wanted to, you couldn't likely buy the same trucks you bought last time out. Payload capacity has gone up on many models, and horsepower along with it. The traditional 35-ton workhorse is now rated at 40 tons, with similar upgrades in 50- and 85-ton classes as well. Horsepower is up, but improved engine manufacturing tech-

niques and fuel injection systems have also boosted fuel efficiency. Almost all offer upgraded features and more electronics.

The aggregates industry, among the most competitive businesses in the world, brought on much of this change by itself. Manufacturers have pursued technological innovation to get every last nickel's worth of performance out of their trucks.

Congratulations. Competition pushes progress and you benefit.

Selection based on site needs

Everybody in the business knows the equipment has to be matched to job needs. But, it's worth reviewing your operation and equipment fundamentals just to make sure your assumptions are correct—and that you compare apples to apples when you start looking.

The most important piece of process equipment is, without doubt, the crusher. Everything (and everybody) else is there to keep the crusher busy. By common sense then, your truck fleet must have enough total payload capacity to keep the crusher continuously at work, plus a cushion.

You're also going to match your trucks to the loading tool. That means:

- The right number of trucks and the right capacity to serve crusher and/or stockpiles without making the loader wait or causing a line of trucks waiting on the loader. Both situations hurt productivity and drive up cost.
- Truck bed size and a



Frame construction is an important consideration in the buying decision. Frames should be box section mild steel with castings at critical points.

configuration that makes a good loading target, allowing quick spotting of the bucket and even load distribution. Optimum load time is about two minutes or three to four passes with no partial bucketloads.

And while you're thinking about the job, what about the future? If you are buying trucks today and can foresee expansion within the next few years, it may be wise to make today's purchase with tomorrow in mind. How many trucks of what size will you need two years from now? Five years? What about the loading tool? Will it need to change? Will you replace or add crushers?

A clear trend in the aggregates business is the move to larger machines, but fewer of them. As older fleets of smaller equipment come up for renewal, producers are moving to larger loading and hauling units—handling the same tonnage with fewer machines at lower cost. The objective is increased productivity, not necessarily higher total production. A case in point: the producer who has gone from four 35-ton to three 50-ton units.

Production remains about the same, but with a substantial improvement in tons-per-man-hour and lower maintenance cost. Here are a few considerations to take into account as you begin looking at new haul trucks:

- **New cabs.** Cabs are no longer just a place to sit, but have become the truck operator's office. Typical features include not only air conditioning, radio

mount, and well-placed controls, but pressurization to prevent dust, lower sound levels and a new generation of suspension seats.

- **Horsepower ratings.** Gross horsepower ratings may be misleading. Flywheel horsepower is the preferred rating for comparison, since this more closely measures the power that can be applied to moving the truck.

- **Retarding systems.** Two types of retarding systems are available: One acts on the driveline, the other works through the brakes. The brake-retarding system spares drivetrain components from tremendous reverse-torque loads and helps prolong machine life. In addition, the brake-retarding system takes advantage of advanced brake systems.

The most effective brakes today are oil-cooled, multi-disc type which provide up to five times the life of shoe brakes and never need adjusting. Multi-disc brakes are not to be confused with caliper-disc brakes, which are similar to automotive-type disc brakes and rely on a pliers-like squeeze to slow the wheel. The multi-disc design multiplies the braking surface, but eliminates metal-to-metal contact. A pressurized flow of oil separates discs and carries away friction-generated heat.

One system combines retarding, emergency, service and parking functions in a dual-piston design.

- **Frame design.** Basically, the life expectancy of a truck comes down to chassis strength. Frames should be box-section construction with high weld penetration in the manufacturing process and castings at high stress points. Frames should also be weldable to allow field repairs without high-technology weld procedures.

- **Electronic controls.** Modern electronics allow substantial improvement in the control of various machine functions and components. Electronic transmission control, for example, assures smoother shifts to minimize torque spikes. The result: greater transmission and engine life and greater fuel efficiency.

Electronic monitoring systems for vital machine functions are not only more reliable than mechanical gauges, they give the operator both visual and audible alarms.

Future applications will contribute to further improvements in machine reliability, performance, and fuel economy.

- **Traction control.** If your haul road is subject to periodic slippery conditions, a traction-assist feature on the rear axle may be worthwhile, not only for

Articulated trucks may meet special needs

An articulated truck (AT) can haul a load through underfoot conditions that would stop a fixed-frame truck, but it fills a highly specialized niche. Designed to work in slippery terrain and adverse weather in Europe, these machines have a high payload-to-weight ratio and are extremely maneuverable. They are not recommended for high-impact loading, but can easily handle overburden, sand, and gravel.

They're increasingly popular in

North America. A number are at work as yard machines. ATs are generally available in capacities of 25 to 40 tons, and new models offer a variety of improvements. They are available in two- and three-axle configuration. Two-axle versions meet most needs.

If you have to live with consistent bad weather or soft, slippery, and twisty terrain and material is suitable for an articulated truck—this versatile machine might meet your needs.

improved control and handling but also for reduced tire wear. Two types are available:

1. **Mechanical systems** similar to automotive-type, limited-slip differentials.

2. **Electronic controls** that monitor wheel rotation on each side independently and, when one exceeds the other by a set limit, applies the brakes, transferring torque to the tire with better traction. Electronic traction assist doesn't interfere with normal differential action and places no increased stress on the driveline.

Compare costs, apples to apples

Having determined your production requirements, you've effectively narrowed the field of candidate trucks and now it's just a matter of comparing costs.

Comparing cost, unfortunately, isn't as straightforward as it could be. Two reasons:

1. Specs vary, so you'll need to be careful in comparing features, performance, and ratings. This is especially true for body capacities, horsepower figures, torque curves, and related information.

2. Owning cost goes far beyond the initial purchase price. Over the life of the machine you have to add maintenance expenses—fuel, lubricants, antifreeze, belts, filters, etc.—plus parts and repairs. Seemingly minor variations in fuel consumption, payload and performance can make a substantial difference in total cost over the life of the truck.

This projected cost should be part of your truck selection criteria—along with requirements for routine maintenance.

Routine truck service is facilitated by clustering of lube points, ground-level access to filters and fill points and modular components. In some machines, the time required for service can be significantly reduced when work can be done without removing major components.

The greater the maintenance



Easy access to routine maintenance points, from the ground or from platforms on the truck, helps keep maintenance hours and cost down.

requirement—and the more difficult access to maintenance points and time needed for the work—the greater the long-term cost and risk maintenance will be overlooked.

Producers are moving to larger loading and hauling units

Increased equipment sophistication and high cost of service operations have prompted another trend: increased reliance on equipment dealers and maintenance contracts.

Today's equipment dealers offer a much broader variety of product, support choices than in the past. Among these are:

- Component rebuilding and replacement programs.
- Plans to monitor machines on the job and schedule repair before failure.
- Guaranteed maintenance contracts that assure product availability and put a lid on cost.

The aim, of course is to keep machine availability and productivity up and eliminate unscheduled downtime.

In addition, long ownership periods typical of the aggregates industry are likely to drop as managers trade machines at the end of peak economic life—usually a much shorter life term than mechanical life. The net result is, again, improved cost control and reduced cost per ton.

Finally, you may find that tax considerations make buying equipment usage through leasing more attractive than outright purchase.



Steep grades put emphasis on horsepower and fuel efficiency. A good haul road maintenance program can cut equipment cost.

Computerized management

Small computers have already helped aggregates managers become better business people, improving their ability to manage the business and track material and labor cost.

Software is available to help design plants and control functions in addition to traditional accounting programs. Other software, such as the FLEET-MATCH, VEHSIM, and Maintenance Control System packages offered by Caterpillar, give valuable help in equipment selection and maintenance management.

One program, for example, allows equipment users to compare several equipment investment choices with relative operating cost and productivity before purchase. Another program schedules maintenance and tracks productivity of individual machines.

A more advanced program allows users to model various job conditions to optimize haul road layout and equipment selection.

Another analyzes whether equipment repair, rebuilding, or replacement is the most economical choice.

These tools can help take pain—and cost—out of new haul-

truck buying decisions.

Here are four additional job areas where a little extra effort can pay big dividends in higher productivity, improved equipment life and reduced cost.

• **Haul roads.** If you don't have a haul road maintenance program, implement one. Roads should be adequately watered and well-graded, with a minimum of obstacles. Turns should be as wide as possible and superelevated; edges should be bermed. A good haul road maintenance program is one defense against premature and costly tire replacement.

• **Tire maintenance.** Like maintaining haul roads, a tire maintenance program can cost lit-

tle and help a lot (See page 40). Tire manufacturers and industry consultants agree on the basics: paint correct pressures on the rim and check regularly; inspect tires regularly for damage; make sure all tires on the machine match; maintain haul roads. More detailed programs and personnel training are available from equipment dealers and industry consultants.

• **Equipment inspection and maintenance.** You probably already have a maintenance program that meets your needs. If you're looking at new machines, you might also want to rethink maintenance. Operations where frequent, regular machine inspections are part of the program report lower downtime and maintenance cost. Some include inspections at the beginning or end of each shift by a mechanic rather than the operator. Whatever the method, careful machine management can help head off big problems. Help in setting up a program and training personnel is available from most dealers.

• **Operator training.** Frequently overlooked as a way of reducing equipment cost, operator training can be an important part of cost-effective fleet management. Even the best operators can use a refresher course, an orientation to new equipment or an opportunity to un-learn bad habits. Poor operating habits, such as pulling away from dumps with the bed up or careless loading can quickly cancel out the steps you've taken to reduce cost per ton. Again, training is available from most dealers. ■

Going shopping

Making the right investment decision on new equipment can be easier with a little advance consideration. Think through the steps and then see your equipment dealer. You've got more than a few options—and may even be able to boost productivity while cutting operating cost.

- ✓ Review current and future operating needs and objectives.
- ✓ Review truck fundamentals and features.*
- ✓ Make sure you're comparing apples to apples.
- ✓ Consider leasing and guaranteed maintenance plans.
- ✓ Check haul-road and equipment maintenance practices.
- ✓ Investigate service personnel and operator training.

