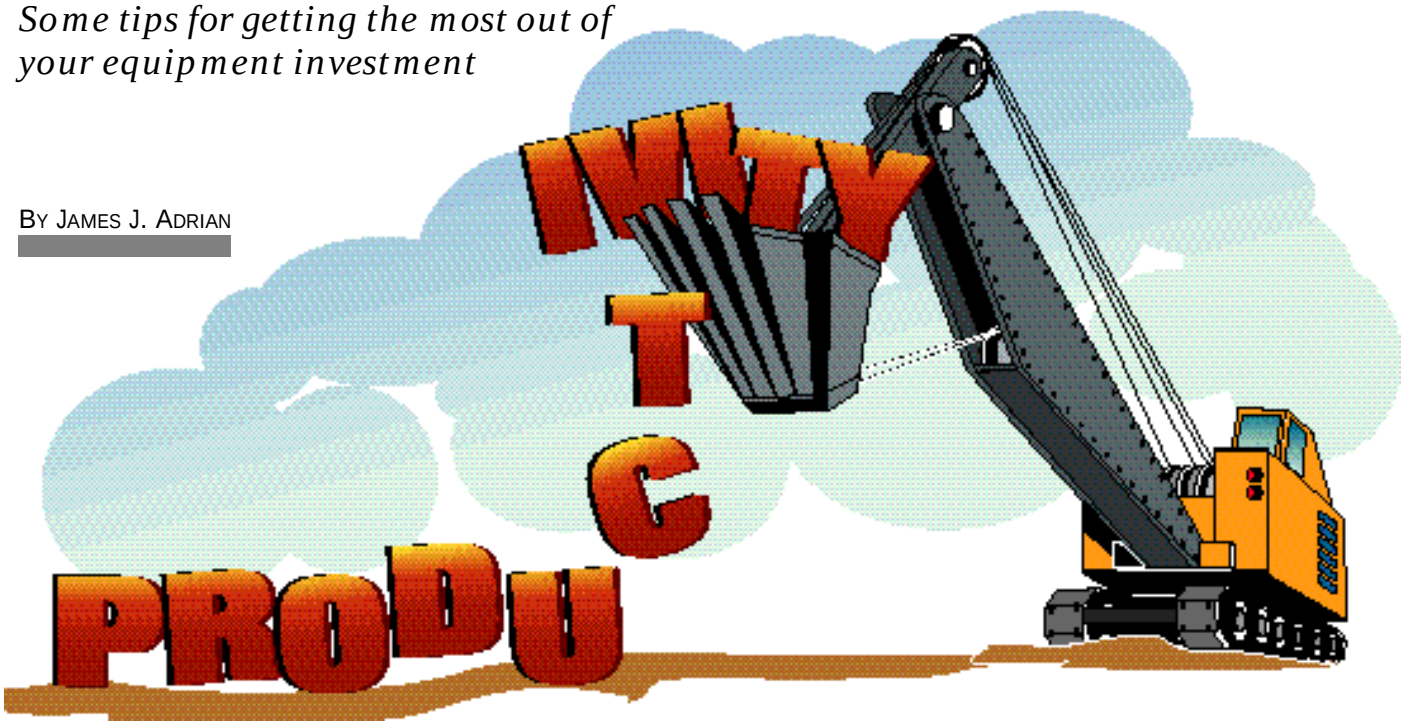
Six Ways to Increase Construction-Equipment Productivity

Some tips for getting the most out of your equipment investment



By James J. Adrian

Productivity, or rather the lack of it, is the foremost problem confronting many construction firms. Contractors commonly measure their productivity by taking their output (measured in dollars or units) and dividing it by the number of labor hours required to achieve the output. But productivity is the efficiency by which materials are placed by labor *and* equipment. By focusing only on labor hours and ignoring equipment hours, you do not get a true measure of your total productivity.

Labor Productivity vs. Equipment Productivity

So why do contractors pay more attention to labor productivity than to equipment productivity? That misguided attention likely stems from the fact that construction firms often view workers as an hourly cost. However, many types of large construction equipment—such as cranes, excavators, concrete pumps and pavers—also have an hourly cost.

I have conducted studies indicating, on average, that workers are productive about 50% of an eight-hour workday. By productive, I mean doing necessary and value-added project work such as erecting concrete forms or placing and finishing concrete. During the rest of the eight-hour day, workers are engaged in nonproductive activities such as waiting for materials, waiting for instructions from supervisors, redoing unacceptable work or looking for tools. Although this percentage of nonproductive labor hours certainly should be a concern to construction firms, let's compare it to the average percentage of nonproductive hours for construction equipment.

According to leading equipment manufacturers, contractors can expect to get 800 to 900 productive hours from a typical piece of equipment in a given year. Assuming a 2,080-hour work year (52 weeks, with a 40-hour workweek) and 800 hours of productive equipment time, con-

struction equipment is nonproductive 62% of the time, which is significantly higher than the 50% nonproductive time for workers.

Contractors can take steps to improve both labor and equipment productivity. But since equipment doesn't have an attitude, whereas occasionally a worker might, equipment often is easier to manage. Following are six ways you can increase productivity by improving equipment management.

1 Keep Track of Productive, Standby and Nonproductive Time

Like a laborer, a piece of equipment at a jobsite is either working or not working. To improve equipment productivity, you must keep daily records of how equipment time is being used. Record the percentage of time each major piece of equipment is in one of the following states:

- Productive (performing necessary work)
- Standby (able to do work, but no work is available)
- Nonproductive (not capable of doing the work, broken, or doing unnecessary or low-value tasks)

By comparing these percentages, you can determine how effectively supervisors are using equipment at different jobsites.

The table above, for example, shows a concrete pump's work percentages for two different jobs. By comparing the data, a contractor can see that the standby and nonproductive times for the pump are greater on Job 1 than on Job 2. By investigating the causes of these differences, the contractor can take steps to increase productivity.

For equipment-intensive jobs, the ratio of productive to nonproductive equipment time can be one of the best measures of supervisor performance. Some contractors use equipment productivity results as a determining factor for supervisor bonuses and profit sharing.

Work States of a Concrete Pump	Job 1	Job 2
Productive	42%	62%
Standby	30%	16%
Nonproductive	28%	22%

2 Consider the Hourly Cost Of Owning or Renting Equipment

To effectively manage labor and equipment, you must know what they cost. Most construction supervisors know workers' wage rates, but they may not know the hourly rates for major equipment such as a concrete pump or a crane.

Equipment is expensive. Example hourly rental rates for several types of construction equipment are shown in the table on page 894. To encourage construction personnel to view equipment as money, not just a machine, try posting or painting the hourly cost of renting or owning equipment right on the equipment itself, visible to all. Following are other ways you can make employees more aware of equipment costs:

- Show employees the hourly equipment costs used in the estimate, and share information about actual equipment costs vs. the budgeted amounts.
- Make equipment part of the hourly cost of a work crew, so employees can see the impact on the bottom line.
- Post the hourly costs of expensive equipment near the jobsite trailer or entrance to stress to workers that idle equipment is wasted money.

3 Monitor Variable vs. Fixed Costs

Equipment costs are either fixed (a function of time only) or variable (a function of equipment use and activity). Fixed costs include financing, interest, property tax (if applicable) and replacement. Variable costs include depreciation, maintenance, repair and operating expenses.

It's important that you keep careful records of these costs in case of contract disputes. Two situations may initiate disputes about equipment costs: added work and project delays. When a contractor has to perform more work because of a change order, the project owner may take the position that as long as the project took the same amount of time as specified in the contract, the contractor is not entitled to additional hourly costs for owned equipment. When a project delay requires the contractor to have the equipment on the job longer than anticipated, the project owner may take the position that unless the contractor can show that another project was waiting on the equipment, the contractor is not entitled to additional compensation.

Contractors who keep careful records of fixed and variable costs can justify requesting compensation for additional variable costs incurred when they have added work but not added time. Similarly, when a project is delayed but no work is added, they can make a strong case for requesting compensation for fixed costs.

4 Manage Equipment Maintenance and Repair

Not only is construction equipment expensive to purchase (often costing more than $100,000 for a large piece of equipment), it's expensive to maintain and repair. In fact, the average hourly cost of maintenance and repair can exceed the purchase cost broken down into an hourly depreciation cost. One equipment manufacturer breaks down the typical hourly ownership cost of a $100,000 piece of equipment as shown on page 894.

Though equipment maintenance and repair costs are expensive, even greater are the addition-

Depreciation (purchase cost – salvage component)	=	$ 8.00
Maintenance cost	=	$ 7.00
Repair cost	=	$ 8.00
Other cost components (such as financing, insurance and operating costs)	=	$23.00
Total hourly cost	=	$46.00

al costs you can incur due to lack of proper equipment maintenance and repair. Some of these costs (both direct and indirect) include those associated with:

- Idle project resources (particularly labor) and project delays caused by equipment downtime
- Less-than-optimal equipment performance
- A construction accident that results because of equipment breakdown
- Major repairs resulting from the failure to maintain equipment or make minor repairs

To minimize nonproductive equipment time and repair costs, implement a preventive maintenance program by setting up a schedule for regular maintenance and repair. Such a program can help you avoid equipment failures and the nonproductive labor and equipment costs these failures cause.

5 Schedule Equipment Efficiently

You should prepare schedules for equipment just as carefully as you prepare schedules for labor. The objective is to preplan the use of equipment to attain maximum productivity. For example, if a schedule calls for the use of a crane or concrete pump only two out of every five workdays, a contractor—at best—can expect 40% productivity with the equipment. By resequencing the schedule so that the equipment can be put on more projects and is in use three days instead of two, the contractor can raise the potential for productivity to 60%.

To help in efficient equipment scheduling, some contractors use inventory systems that track where a piece of equipment has been, where it is and where it's going next. Such a system may be as simple as a regularly updated chart on a blackboard or as complex as a computer software program that tracks each piece of equipment a firm owns. Not knowing the whereabouts of a piece of equipment when it's needed can result in hundreds, if not thousands, of dollars in idle equipment and labor costs.

6 Select the Right Equipment For The Job

One of the major causes of low productivity is not using the right equipment for the job. Contractors can seldom afford the latest and greatest piece of equipment; instead, they often rely on the equipment they have to do the job, even if it's not the most productive or cost-effective option.

Even if your finances curtail new-equipment purchases, it's still in your best interest to do an equipment cost analysis for every project. Sometimes this analysis will show that it's more cost-effective to rent a more productive piece of equipment for a task, even if you own equipment that can do the job but at a higher hourly or unit cost.

It's also important for contractors to regularly attend industry trade shows, such as the World of Concrete. Knowing about the latest construction equipment and technology can help you determine the best equipment for a project. Using outdated, inappropriate or ineffective equipment to do a task can lead to low productivity, high costs, time delays and an increase in accidents. You must consider all these factors when selecting the right equipment for a job.

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To learn additional ways to improve construction-equipment productivity—including how to develop an accounting process for owned equipment—attend Adrian's World of Concrete '98 seminar How to Select, Maintain and Increase the Productivity of Equipment (19-40). For more information, see the World of Concrete brochure in this issue or call 800-837-0870. You can also visit the World of Concrete Web site *(www.wocexpos.com/usa.htm)*.

HOURLY EQUIPMENT-RENTAL RATES*

Type of Equipment	Rate
Paver	$180
Concrete mixer	$125
Concrete boom pump	$105
Conveyor (46-foot)	$ 30
Backhoe	$110

* Does not include hourly operating costs.