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Excerpt from

Introduction to Small Engines

Preview

The following is a sample excerpt from a study unit converted into the Adobe Acrobat format. A sample online exam is available for this excerpt.

The sample text, which is from the Small Engine Repair program, will introduce you to the expanding field of small-engine servicing. You'll learn how small engines are used in commercial, residential, and industrial applications.

After reading through the following material, feel free to take the sample exam based on this excerpt.

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EXAMINATION

Introduction to Small Engines

INTRODUCTION

The Growing Field of Outdoor Power Equipment Repair

Welcome to the exciting world of outdoor power equipment! You're probably saying to yourself, outdoor power equipment, exciting? Come on! Well, we believe that once you complete this study unit, you'll find that the outdoor power equipment field can be lots of fun. And, once you see the opportunities available to qualified technicians (and how much money you can save by doing your own repairs), you'll be well on your way to enjoying this career field!

The outdoor power equipment field has really grown in the past few years. Small gasoline engines power more machines now than ever before. This equipment is used not only by individuals but also by many businesses and industries. Visit a local hardware store; you'll probably have a new appreciation for just how many types of equipment are powered by small engines! If you're like most people, you already own at least one gas-powered machine yourself. Keep in mind that all of this equipment requires periodic maintenance and servicing, along with all types of repairs.

Later in the unit, we'll take a closer look at some of the many types of gas-powered machines that are produced today. You're probably familiar with many of these items, such as lawn mowers, weed trimmers, and snow throwers. However, you may not have thought of the many other gas-powered devices such as water pumps and portable generators. All of these machines contain small engines, and all require the frequent services of qualified outdoor power technicians. But first, let's look more closely at the small engine itself, and the small-engine repair field.

What Is a Small Engine?

The term *small engine* can be somewhat confusing. For example, a typical lawn mower engine may be small compared with the engine in your car. However, the lawn mower engine seems quite large next to an engine that powers a model airplane. Similarly, the engine in your car is quite large compared to the engine found in a lawn mower, but it would be much smaller than the engine in a large locomotive or cruise ship. As you can see, the meaning of "small engine" is relative depending on your point of view.

However, when we use the term small engine in this course, we're referring to a gas-powered engine that produces less than 25 hp (horsepower). At this point, you may not be familiar with horsepower, but we'll discuss this term in detail later in the unit. The important thing to remember is that (in general) the larger the engine, the more horsepower it produces. Figure 1 shows a typical small engine.

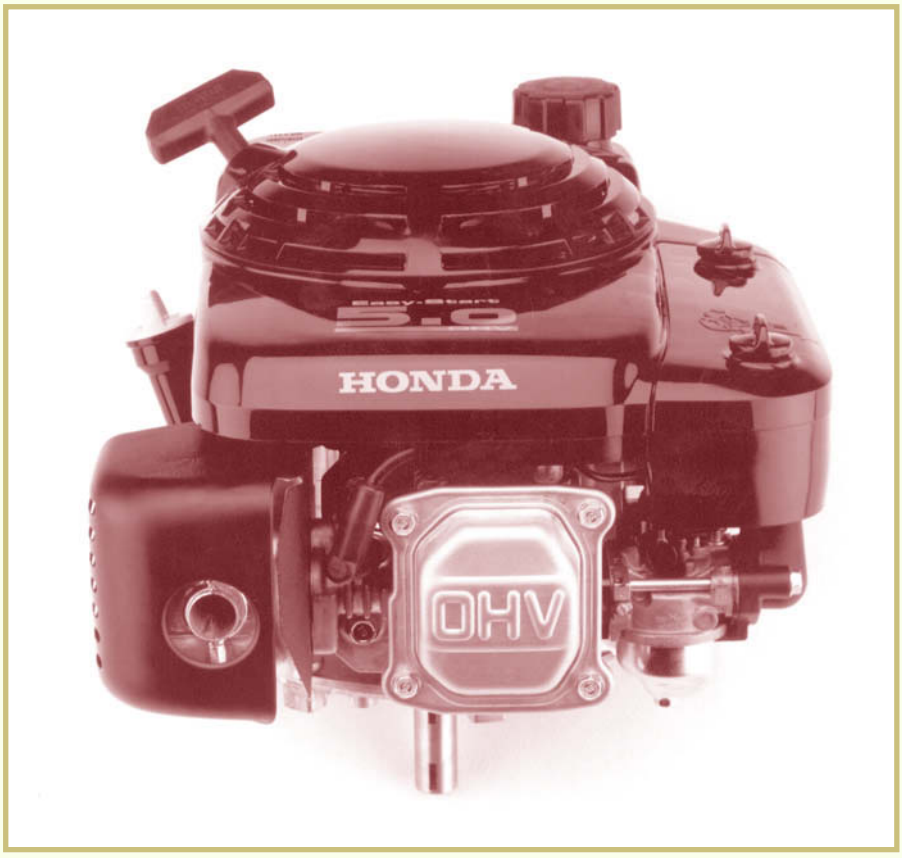

FIGURE 1—This 5 hp, pull-start engine is used to power a lawn mower.
(Courtesy American Honda Motor Co., Inc.)

As you'll learn, small engines are used in various applications. The term *outdoor power equipment* refers to the types of equipment that are powered by small gasoline engines and that are generally used outdoors.

Many different companies manufacture outdoor power equipment. However, the engines in these machines are made by only a few companies. The best known small-engine manufacturers are Briggs and Stratton, Tecumseh, Honda, and Kohler.

Outdoor Power Equipment Technicians and Small-Engine Mechanics

Throughout this course, you'll see the job titles "outdoor power equipment technician" and "small-engine mechanic." What exactly is the difference between them?

Well, the difference is simple. Small-engine mechanics have been around for many years. These skilled professionals are trained to repair small gas-powered engines. In contrast, outdoor power equipment technicians know how to repair small engines *and* other parts of gas-powered machines.

So today's outdoor power equipment technician may perform repairs on the mower deck of a lawn mower, the cutting cord of a weed trimmer, or the blades of a snow thrower as well as the engines in these machines. For this reason, more and more service people prefer to call themselves outdoor power equipment technicians to reflect the wider scope of their jobs. Most manufacturers of outdoor power equipment also use this newer title. However, you can certainly call yourself a small-engine mechanic if this is the job title you prefer.

Careers in the Field of Small-Engine Repair

Now, let's take a closer look at what makes the outdoor power equipment field such an attractive career opportunity. The wide variety of machines powered by small engines offers many profitable possibilities for the small-engine technician.

First, since so many types of machines use small engines, there are opportunities for repair technicians in almost all regions, urban and rural. People in rural areas are naturally more likely to own gas-powered machines than those who live in cities. For example, people who live in the country or own larger properties are more likely to own chain saws, large lawn mowers, garden tractors, tillers, portable generators, and so on.

If you live in an area near a lake or the ocean, you may be able to pursue a career repairing outboard motors. Or, if you live in an area that attracts tourists, you may be able to find profitable work in the repair of recreational equipment, such as amusement rides, go-carts, and so on. You can see that there are many opportunities for you as a small-engine technician no matter where you live.

Small-engine technicians also have the advantage of being able to pursue their trade year-round. Although a mainstay of many small-engine businesses is the repair of summer lawn care equipment, many other seasonal opportunities are available to the skilled technician. In colder climates, for example, you can operate a profitable business during the winter repairing snowmobiles, snow throwers, and other such equipment. In warmer areas, the small-engine technician will be able to repair lawn care equipment for most or all of the year.

Many outdoor power equipment technicians have the advantage of choosing whom they want to work for. Some decide to work for someone else, while others open their own businesses. Many technicians are employed by independently owned shops or equipment dealers.

(A quick look through the telephone directory will give you an idea of how many of these shops are located in your area.) However, your opportunities aren't limited to existing repair shops. Many of the retail outlets that sell outdoor power equipment (such as large department stores) also have their own repair centers. These centers can offer many job opportunities for skilled technicians.

In addition to repair businesses, many companies that use a large number of small engines (such as equipment rental companies or large construction companies) employ their own technicians to keep all of their equipment operating properly. Even places that offer recreation equipment rentals (like snowmobiles, boats, and go-carts) hire their own full-time repair technicians.

The outdoor power equipment field also offers the possibility of advancement. Many larger repair shops employ service managers. The service manager oversees the work of the other technicians in the shop, schedules the workload, and deals directly with customers on repair matters. There are other opportunities in related areas, such as in parts departments or equipment sales.

Many technicians find it helpful to start by working in an established repair business to gain valuable experience. However, if you've always dreamed of opening your own business, the outdoor power equipment field might be an excellent choice for you (either on a part-time or full-time basis).

The small-engine repair business has several advantages over similar repair businesses such as auto repair. One of the major advantages is low cost. The small size of the engines and the machines that use them means that your business won't require a huge amount of space. In fact, many small-engine businesses begin in a standard one- or two-car garage. So your business could easily be run from home or from a small rented shop that would be affordable. In contrast, an auto repair business would require a much larger initial investment in tools and equipment to get started (perhaps thousands of dollars).

Another advantage of the small engine business is the low cost of the tools required to perform repairs. Like almost all service technicians, outdoor power equipment technicians are usually required to own their own tools (even if they're employed by someone else). Therefore, the cost of tools is an important consideration, especially for those who are just starting. Luckily, the cost of tools and equipment in the small-engine business is low. Most repairs on small engines require only a standard tool set. Even the specialized tools in this field tend to be relatively inexpensive.

Another advantage of the outdoor power equipment repair field is the availability of parts. As we saw earlier, many different types of machines use small engines but only a few different manufacturers make the engines themselves. This means that parts are easier to obtain, and they generally cost much less than those required for automobile engines.

Since the cost of most parts is relatively low, you may want to be a parts distributor as well as a technician. Then, whenever a customer's machine needs a major repair, you'll be able to sell the needed parts as well as your repair services. You may also choose to sell the various accessories used with outdoor power equipment, which can provide lots of extra business.

Professional Qualifications

What are the qualities that separate an excellent technician from one who isn't so skilled? The answer is knowledge, training, and certification. The skills you'll learn in this course, combined with some hands-on experience, will be all you'll need to get started in the field. It will also be helpful to obtain certification from a small-engine manufacturer or a related professional organization. Let's look at how you'll go about achieving your goal.

First of all, a small-engine technician should have a fairly broad knowledge of all types of outdoor power equipment, and a detailed knowledge of small-engine disassembly, troubleshooting, repair, and reassembly. Most skilled small-engine technicians have had some formal training in the repair field and, after gaining some experience, have mastered the skills needed to repair all types of equipment.

Just about any average person can learn to replace defective parts. However, a professional training program can change a person from a "parts changer" into a skilled troubleshooter. Plenty of work is involved in learning how equipment operates, how to make repairs, and (most importantly) how to diagnose problems. The key to learning how to diagnose problems is the completion of a thorough training program (such as the course you're taking now). By successfully completing such a program, you'll have earned a diploma that tells everyone you're a true professional.

Another excellent way to demonstrate your skills as a repair technician is by completing a certification program. Most such programs are simply "practical exams" that are sponsored by manufacturers or professional associations. These exams are designed to test your skills in various areas of the repair field. When you successfully pass such an exam, the group awards you a certificate.

In most cases, it isn't necessary for a technician to take a certification exam to be successfully employed. However, a certificate from a professional association is an enhancement to your job skills, and a good way to prove your skills to customers and prospective employers. Some manufacturers, such as Briggs and Stratton, even offer their own specific certification programs.

In the field of servicing outdoor power equipment, there's a popular certification program sponsored by a group called the *Outdoor Power Equipment and Engine Service Association (OPEESA)*. The certification test has been created by the *Equipment & Engine Training Council (EETC)*. You can choose to test in any of several different specialized areas (such as two-stroke engines, four-stroke engines, compact diesel engines, and generators). After completing your studies, you may want to consider getting an EETC certification. The certificate, along with your diploma from this program, will enhance your prospects for employment in this field. For more information on certification and testing, contact

OPEESA EETC Certification
210 Allen Drive
Exton, PA 19341
(610) 363-3844

OPEESA Web—http://opeesa.org/ e-mail—jwkopeesa@bee.net
EETC Web—http://www.eetc.org/ e-mail—eetc@eetc.org

Personal Requirements

Qualified outdoor power equipment technicians come from all walks of life and from a variety of age groups. Anyone who's willing to learn the job can become a small-engine technician. However, you can develop a personal advantage in the job market by being energetic, ambitious, and self-confident. If you want to be self-employed, you'll also need to develop a commitment to making it on your own. There are challenges in being your own boss! However, if you have ambition, communicate well, and are willing to work hard, you'll succeed.

TYPES OF OUTDOOR POWER EQUIPMENT

Residential and Recreational Uses of Small Engines

As we stated earlier, outdoor power equipment is used by both individuals and commercial businesses. The purpose of this section is to give you a better awareness of just how many different types of equipment use small gasoline engines. We'll discuss most of the equipment in detail later in the course, so for now just become familiar with what's out there.

Let's begin by looking at some of the common types of equipment used at home. For anyone who has a lawn, the most important machine by far is the lawn mower. If you've ever cut grass with an old push-type grass cutter, you know that the gas-powered lawn mower is one of the world's greatest inventions.

A lawn mower (Figure 2) uses a small gas engine to power a rotating steel blade. As the blade rotates, it cuts grass to a uniform height. The operator controls the mower by walking along behind it. There are two basic types of lawn mowers: the *push mower* and the *self-propelled mower*. A push mower must be pushed around the lawn by the operator. In contrast, the engine in a self-propelled mower powers both the blade and the wheels of the mower.

Both types of mowers have advantages. Self-propelled mowers require less effort to operate, but they're more expensive and heavier than push mowers. In addition, self-propelled mowers aren't easy to use in spaces where tight turning is necessary. In contrast, regular push mowers are relatively inexpensive and easy to maneuver.

Lawn mowers require all kinds of maintenance. The common services performed include blade sharpening, blade replacement, tune-ups, oil changes, and so on. Lawn mower servicing makes up a large part of an outdoor power equipment technician's day-to-day business.

FIGURE 2—Shown here is a typical lawn mower. (Courtesy American Honda Motor Co., Inc.)

Small lawn mowers are great, but when you have a large yard, nothing is better than a *lawn tractor* (Figure 3). The lawn tractor performs the same function as the lawn mower, but the operator drives the tractor like an automobile instead of pushing it. In fact, some of today's more expensive lawn tractors have many of the conveniences of your car, such as power steering. Lawn tractors usually have engines slightly larger than those used on lawn mowers. Tractors also have steering and transmission systems, just like automobiles.

Lawn tractors share another feature with your car—they can be quite expensive. Since the owners have spent more money on their tractors, they'll want to take better care of them, having all periodic maintenance and repairs done professionally. In addition, due to the high cost of replacement, lawn tractors are almost always repaired rather than replaced whenever possible. For these reasons, they offer excellent opportunities for a repair technician.

Another useful gas-powered machine used in lawn care is the *weed trimmer*. A weed trimmer uses a small gas engine to rotate a plastic or steel cutting line. The line or blade spins at high speed, easily cutting weeds and grass, but doesn't harm solid items like walls and fences.

FIGURE 3—A lawn tractor like the one shown here will require a variety of routine maintenance procedures and repairs. (Photo courtesy of Gravely International)

The engine is normally located near the handle, and a long flexible shaft extends from the engine to the end where the line is attached. Most weed trimmers use a fairly small engine compared with that of a lawn mower.

A similar piece of outdoor power equipment is the *leaf blower*. The leaf blower contains the same type of small engine found in the weed trimmer. However, a leaf blower uses the engine to rotate a fan blade rather than a cutting line. The rotating fan blade produces a strong airflow that can be used to blow leaves off sidewalks, driveways, and lawns.

If you have a garden in your yard, you may be familiar with another common piece of gas-powered equipment—the *garden tiller* (Figure 4). A garden tiller is used to dig up and turn soil for planting. The machine uses a small engine to turn a blade that digs up the soil.

Some other types of gas-powered lawn equipment that outdoor power equipment technicians can expect to work on are *lawn sweepers*, which are basically large vacuum cleaners for your yard, and *hedge trimmers*, which are used to trim and shape hedges.

Lawn maintenance isn't the only job that small engines are used for. Gas-powered engines also drive *chain saws*, which are used to trim or cut down trees. A chain saw uses a small engine to rotate a cutting chain.

FIGURE 4—Gardeners will be familiar with the gas-powered garden tiller shown here.
(Courtesy American Honda Motor Co., Inc.)

The cutting chain has sharp blades that can cut through wood. A chain saw requires the same type of engine maintenance as other types of equipment. In addition, the cutting chain may need to be sharpened or replaced, or the filter may need to be cleaned or replaced.

Another piece of outdoor power equipment used on trees is the *log splitter*. Log splitters are used to cut logs into small pieces for use in fireplaces and wood stoves. In operation, a log is placed into the splitter. The cutting blade is then forced into the log, splitting it in two.

The *wood chipper* is another example of a machine powered by a gas engine. These machines are used to chop branches and other yard debris into small chips that can be used as mulch. Wood chippers come in different sizes and are used by professional landscapers as well as private home gardeners.

If you live in a northern or mountainous climate, you're probably familiar with the gas-powered *snow thrower*, also known as the *snowblower* (Figure 5). Snow throwers clear snow from sidewalks and driveways by churning the snow and spraying it several feet away. Inside the snow thrower, a gas engine powers a set of blades that stir up the snow and blow it out through a chute. The operator can direct the spraying direction of the chute.

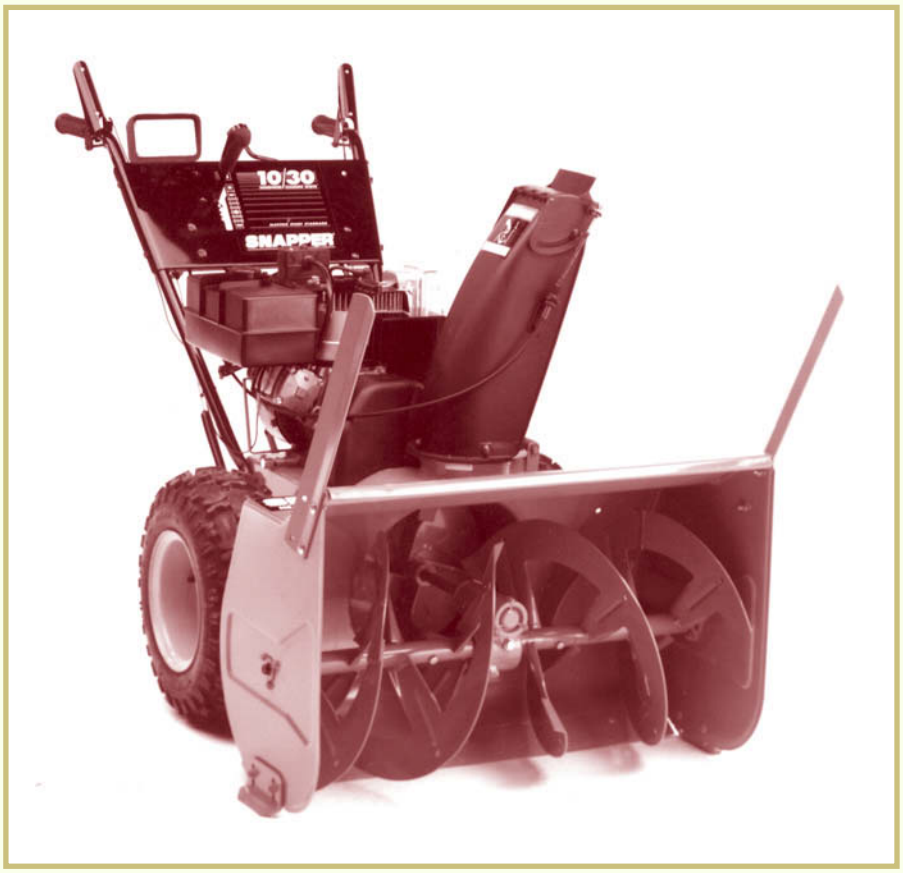

FIGURE 5—The snow thrower is an essential piece of seasonal maintenance equipment for homeowners in northern or mountainous climates.

Pressure washers are also powered by gas engines (Figure 6). These increasingly popular machines can be used to clean just about anything. The gas engine powers a pump that produces a high-pressure water spray. The washers are portable, and the water spray is effective for cleaning everything from cars to the exteriors of houses.

Small engines have many recreational uses, too. One of the most popular uses of the gas-powered engine is in watercraft. *Outboard engines* operate using the same principles as most other types of small engines. The only major difference is that, instead of operating a cutting blade, the engine drives a propeller that powers the boat through the water.

Another popular recreational application of small gas engines is in go-carts. *Go-carts* are simply small cars powered by small engines. The engine drives the wheels of the go-cart by using a chain or a belt. Go-carts are usually operated at small tracks, where customers pay for rides. The tracks are often found in tourist areas and are extremely popular during the summer months. These little cars are fun to drive, and they also offer excellent repair opportunities to local technicians. Since the cars are driven all day long, every day, they require frequent maintenance and repairs.

FIGURE 6—This gas-powered pressure washer produces a high-pressure stream and can be adapted to spray water, chemical cleaner, foam, or even sand for sandblasting. (Courtesy of Graco, Inc.)

Commercial and Industrial Uses of Small Engines

Now that we've looked at some of the equipment used at home and for recreation, let's look at some of the commercial and industrial applications of small engines. One of the most common commercial uses of small engines is to generate electric power. *Generators* operated by gas engines are often found at construction sites where electricity isn't yet available. The generators provide the power needed to run lights, power saws, drills, and so on.

Most portable generators are powered by small gasoline engines (Figure 7). The small size and light weight of the engines allow these generators to be carried easily. In addition, since small engines are available in many different sizes, larger generators are also available. Some large generators may be used to power several electric devices at once.

Some other types of equipment contain their own built-in generators. One example of such a device is a portable *welding machine*. Electric-arc welders are often needed in areas where electricity isn't readily available. Fortunately, gas-engine-powered welders allow welding to be performed almost anywhere.

So far, we've discussed equipment powered by electricity, but what about commercial tools powered by compressed air? Well, just as a gasoline engine can be used to generate electricity, it can also be used to power an air compressor pump. An *air compressor pump* is usually driven by a belt connected to an engine. This arrangement allows compressed-air-powered tools to be used almost anywhere. The same is true for commercial pressure washers. These washers use small gas engines to produce high-pressure water streams.

FIGURE 7—This portable gas-powered generator is used to provide electric power in situations or locations where traditional power sources are unavailable. (Courtesy American Honda Motor Co., Inc.)

Gas-powered paint sprayers are used to cover large areas quickly. These machines can be adapted to spray paint, lacquer, stain, and oil for a variety of applications. A commercial paint sprayer is shown in Figure 8.

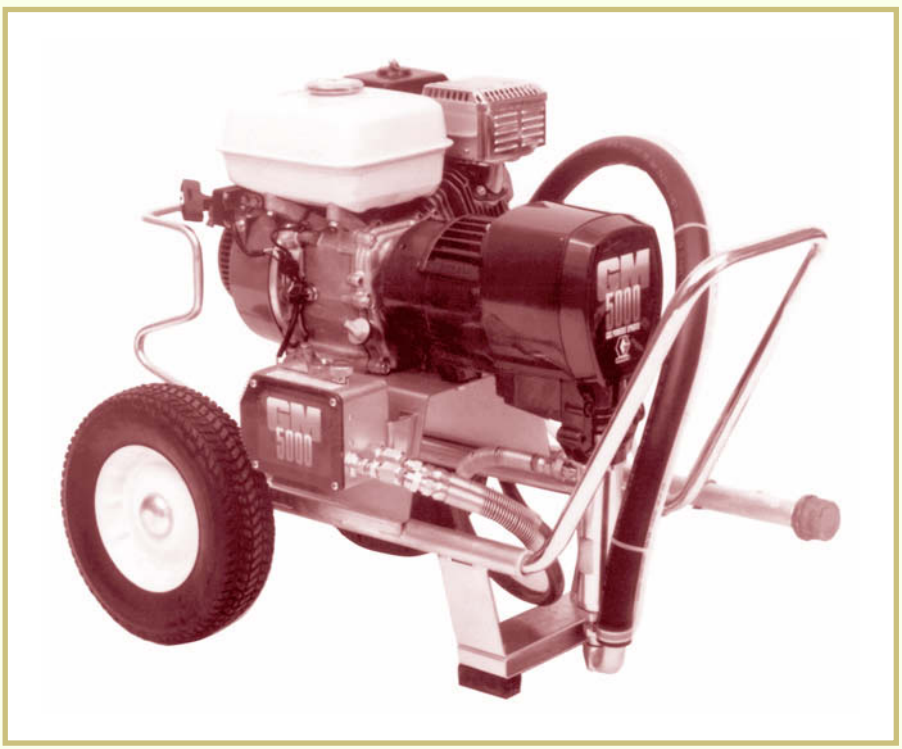

FIGURE 8—This large commercial paint sprayer contains a 5 hp engine and can power up to three spraying guns at once. (Courtesy of Graco, Inc.)

Another variation on the paint sprayer is the *line painter*, which is used in road construction to paint traffic lines and curbs. A line painter is shown in Figure 9.

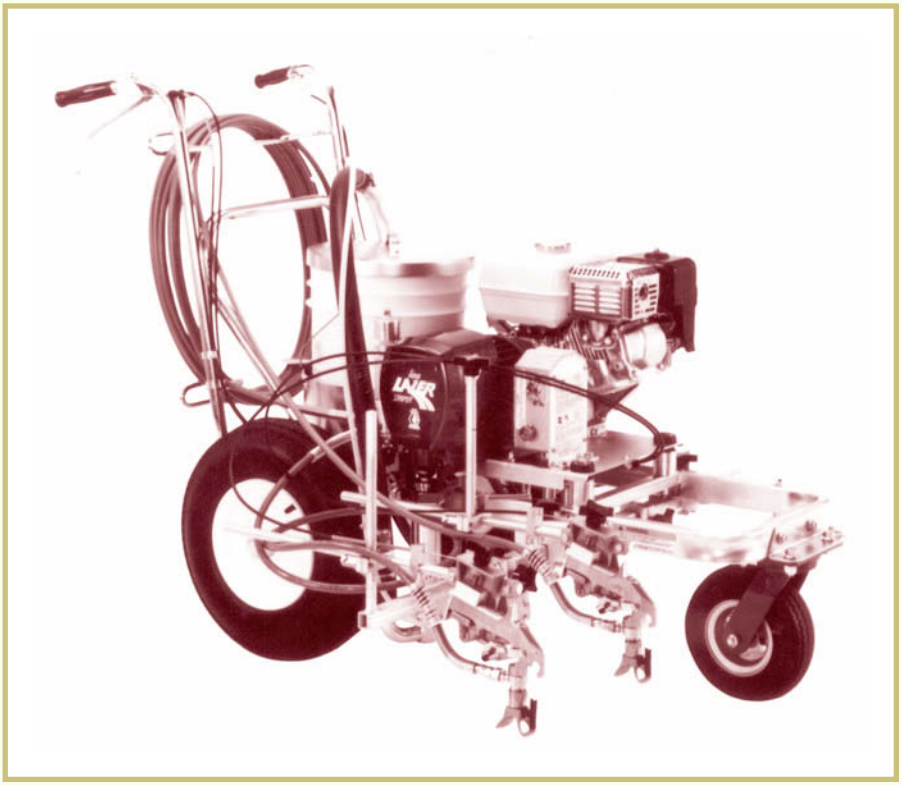

FIGURE 9—This traffic line painter contains a 4 hp engine. Its painting guns can be adjusted to paint both horizontal and vertical lines. (Courtesy of Graco, Inc.)

The industrial applications of small engines we've just discussed are probably the most common. However, there are many other types of commercial equipment that use small gas engines. *Cement mixers*, portable *circular saws* (for cutting concrete in construction jobs), and *sump pumps* (for removing water from flooded areas) can all be powered by small engines. A visit to a local industrial supply store will quickly show you how much gas-powered commercial equipment is available.