MODERN MOTORCYCLE TECHNOLOGY

Third Edition

Edward Abdo

DELMAR CENGAGE Learning

Australia • Brazil • Japan • Korea • Mexico • Singapore • Spain • United Kingdom • United States

Contents

Preface

Modern Motorcycle Technology (MMT) is designed to meet the basic needs of students interested in the subject of motorcycle and all-terrain vehicle (ATV) repair by helping instructors present information that will aid in students' learning experience. The subject matter is intended to help students become more qualified candidates for dealers looking for well-prepared, entry-level technicians.

MMT has been written to make learning enjoyable; the easy-to-read and easy-to-understand chapters and the great number of illustrations will assist visual learners with content comprehension. The book consists of 20 chapters and starts with the history of the motorcycle and ends with information about troubleshooting various conditions found on any motorcycle. Because of the similarity of the technologies used, the servicing of ATVs is automatically included in the text.

MMT can be used not only for pre-entry-level technicians, but also as a reference manual for practicing technicians. Motorcycle technicians are currently sought after and will continue to be in demand in the future as technology advances in the manufacturing of modern motorcycle and ATV products. In today's world, technicians who have an education prior to working in the field are becoming more desirable to hiring dealerships.

I have been in the motorcycle industry on "all sides of the fence." I have been a rider and a racer most of my life, as well as a customer, technician, service manager, motorcycle trade school technical instructor, chief instructor, curriculum developer, manufacturer's service representative, and head of a technical training department tasked to ensure that over 4,000 technicians are up to date with technologies and technical instruction. I am now the owner of a successful motorcycle and ATV shop. I have had a passion for motorcycles since my first mini-bike back in the 1960s, and I have a unique outlook on my job. I love doing what I do! This is something that everyone should strive for, as there is nothing more rewarding.

—Ed Abdo

New To This Edition

The second edition of MMT has been thoroughly updated throughout and includes new content on the latest motorcycle models and technology from today's top manufacturers. This new edition features additional material on key topics such as fuel injection, suspension systems, and V-engine technology. It also provides an expanded suite of separately available supplementary teaching and learning tools—including a hands-on Student Skill Guide and electronic instructor resources available on a companion website. *Modern Motorcycle Technology* is a valuable resource for anyone seeking the knowledge and skills to succeed in today's motorcycle technology field.

Acknowledgments

Many people were instrumental in making this book a reality. There were numerous reviews from those in the motorcycle industry; the suggestions were excellent and helped to make this a better textbook. There are also other people who helped make this book possible whom I would like to acknowledge: Mike Krzemien, Cory Dickson, and Colin Miller were all very helpful with the disassembly of the various engines and components as well as assisting with the updated pictures found on the pages to follow. Deepti Narwat worked closely with me editing and proofreading the following pages. Her expertise and assistance are greatly appreciated. The late George Decker, who many years ago saw something in me that made him think that I could be a technician, hired me for my first job in this industry and became my mentor. There are three others that were all key in helping shape my instructional career: Art Ridgway, unknowingly to both him and me at the time, showed me that teaching what you have learned to others is not only self-satisfying but also rewarding in ways far exceeding my imagination. Art's passion to help others learn inspired me to

want to teach others what I have learned over the years. Mr. Larry Barrington helped me prove to myself that I could get up in front of a large group of students and actually teach! Larry had a way of making me feel at ease in my early stages of teaching when I was questioning my abilities as an instructor. Doug McIntyre taught me more about myself than any other person I have ever had the pleasure to work with. His willingness to listen and help me through my problems when trying to sort through instructional design issues will always be remembered. Next, Bonnie Pearl and my son Nick, for their endless love. The two of them find ways to inspire me every day. There were many more people who have helped me along the way in this great ride of a career, but the page is now getting long, so I will just say thank you to all of you! It is an honor to give back to an industry that has done so much for me. Without all the support I have been fortunate to obtain throughout my life, you would not be reading this.

Reviewers

The author and publisher would like to thank the following reviewers for their valuable input during the development of the first and second editions of *Modern Motorcycle Technology*:

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CHAPTER 2

Safety First

Learning Objectives

When you have completed the study of this chapter and its laboratory activities, you should be able to:

- Understand the importance of safety and accident prevention in a motorcycle shop environment
- Explain the basic principles of personal safety
- Explain the procedures and precautions for safety when using tools and equipment
- Explain what should be done to maintain a safe working area in a service shop environment
- Describe the purpose of the laws concerning hazardous wastes and materials, including right-to-know laws
- Describe your rights as an employee and/or student to have a safe place to work

Key Terms

Alternating current (AC)
Carbon dioxide (CO_2)
Carbon monoxide (CO)
Class A fires
Class B fires
Class C fires
Class D fires
Conductors
Contact dermatitis
Direct current (DC)
Earplugs
Eczema
Fire extinguishers
Fire triangle
Goggles
Halon
Hazard Communication Standard
Headset
Material handling
Material safety data sheets (MSDS)
Metatarsal guards
Motorcycle Safety Foundation (MSF)
National Electrical Code® (NEC®)
National Fire Protection Association (NFPA)
National Safety Council (NSC)
Occupational Safety and Health Administration (OSHA)
PASS
Personal protective equipment (PPE)
Power tools
Respirators
Safety glasses

INTRODUCTION

Most people are concerned with safety in and around their homes. They strive to protect their families from accidents and injuries. But accidents in the workplace are often much more severe than home accidents, because workplaces contain many more potential hazards than the average home. Working on motorcycles can be fun and rewarding, but if the proper precautions are not followed, it can be dangerous as well.

THE SAFETY ATTITUDE

Safety is more than just the absence of accidents. *Safety is an attitude* that helps you prevent injuries to yourself and others. Safe working practices should be a way of life. They should be as instinctive as putting on your seat belt or looking both ways before you cross the street. Safety is not a matter of good luck or bad luck. It is a predetermined set of mental exercises, including the following:

- Planning to work safely
- Recognizing potential safety hazards and eliminating hazards
- Following proper safety procedures at all times, particularly in your workplace

You should be aware that the **Occupational Safety and Health Administration (OSHA)** is the federal agency that publishes safety standards for business and industry. The OSHA regulations affect every business that has employees and sells its products or services. OSHA requires every employer to provide employees with safe workplaces that are free from recognized hazards. For reasons of brevity concerning the legal aspects of OSHA, it is the federal government's law enforcer for industrial-safety matters. Employers are motivated to adopt and use safe working procedures through OSHA's strict enforcement of the regulations. Safety violators receive harsh penalties and fines. You can find a complete list of OSHA's proven safety methods, practices, and regulations in one convenient resource called the Code of Federal Regulations. Even if you are a one-person operation, you should understand and follow OSHA's safety guidelines for your own protection. In a motorcycle service department, the safety matters of primary concern are the following. For reasons of brevity concerning the legal aspects of OSHA, it is the federal government's law enforcer for industrial-safety matters. Employers are motivated to adopt and use safe working procedures through OSHA's strict enforcement of the regulations. Safety violators receive harsh penalties and fines. You can find a complete list of OSHA's proven safety methods, practices, and regulations in one convenient resource called the Code of Federal Regulations:

- Fire safety
- Chemical safety
- Basic electrical safety
- Ventilation of exhaust gases
- Safe operation of engines and equipment
- Good housekeeping practices
- Safe handling of heavy objects and materials
- Proper use of personal protective equipment
- Using Tools Safely
- Safe riding practices

Now that we've provided you with a quick list of the safety topics and areas that OSHA's regulations cover, let's look at these important safety items one at a time.

FIRE SAFETY

A major safety consideration in the motorcycle repair business is fire prevention. Many fires occur in private garages every year, and a significant number of these are started by the mishandling of gasoline, such as storing gasoline in unapproved containers or failing to clean up gasoline spills. Gasoline is the fuel for all current modern motorcycle engines. Because gasoline is one of the most flammable liquids, fire is a serious threat in any motorcycle service area.

Gasoline is not the only flammable liquid used in the service department: oils, lubricants, paints, cleaning solvents, and other chemicals can also create a fire hazard when improperly handled. Despite the fire risk, a service department can be run safely. By following basic safety practices, the danger of fire can be greatly reduced, if not eliminated entirely.

The **National Fire Protection Association (NFPA)** is the largest and most influential national group dedicated to fire prevention and protection. Its mission is to safeguard people, property, and the environment from fires. The NFPA also publishes the ***National Electrical Code*® (*NEC*®).** The *NEC*® is the national standard for all residential and industrial electrical installations in the United States and Canada. When you start planning a fire safety program for your business, check with the NFPA. They can provide useful hints and detailed support information.

The Fire Triangle

There are three conditions that must be present for a fire to start. These conditions are grouped together to form the **fire triangle.** The three components of the fire triangle are as follows:

After a fire starts, the supply of fuel and oxygen must stay at certain levels to sustain the fire. To extinguish a fire, you must remove at least one of these two legs of the fire triangle. You can put out a fire by removing the fuel source or removing the oxygen.

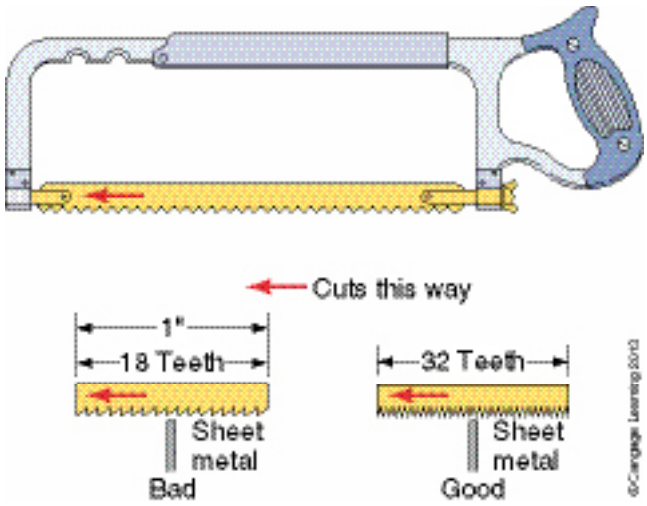


Figure 3-33 A standard hacksaw is shown here with different types of blades.

When analyzing fire prevention, you must always be aware of the ignition sources that could start a fire in your work area. When we consider ignition sources, most of us think of open flames, sparks, stoves, and matches. However, there are several other dangerous, but less obvious, ignition sources.

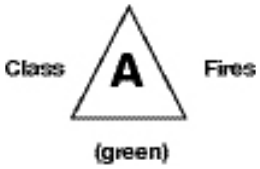
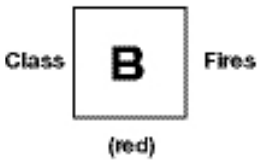
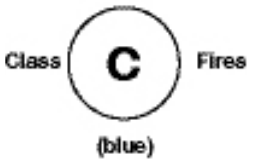
For example, a common but often overlooked source of ignition is the engine exhaust. A motorcycle's exhaust system becomes hot during operation. This heat remains in the exhaust system for a period of time after the vehicle's engine has been turned off. Therefore, if a vehicle's engine is still warm when you begin to make repairs, you must take extra precautions to prevent fires.

Another highly possible source of ignition is cigarette smoking. Smoking-related ignitions are a leading cause of fires. Sparks from lit cigarettes, heat from discarded cigarette butts, and the open flames of lighters and matches can all start fires in flammable and combustible materials. Therefore, smoking should be strictly controlled in a motorcycle service department. Smoking and nonsmoking areas should be posted with distinct, easily recognizable symbols. Smoking areas should be equipped with adequate receptacles to provide for the safe disposal of smoking materials. Smoking is prohibited in many service departments, and smokers must go to a designated outside smoking area.

Spontaneous combustion is another potential source of ignition that you should recognize. In spontaneous combustion fires, the heat for ignition is created by a chemical reaction in combustible materials. One common type of spontaneous combustion occurs when oil- or solvent-soaked rags or papers are discarded in a trashcan. The decomposition of the oil or solvent often produces enough heat to ignite the rags or papers. To prevent spontaneous combustion, all oil- or solvent-contaminated rags and papers should be discarded only in designated, fireproof metal safety receptacles. Routine trash material should not be discarded in these special receptacles.

Using a Fire Extinguisher

Fire extinguishers (Figure 2-2) must be properly used to be effective on a fire. You should become familiar with the various extinguishers installed at your facility before a fire starts. To be effective,

	CLASS OF FIRE	TYPICAL FUEL INVOLVED	TYPE OF EXTINGUISHER
	**For Ordinary Combustibles** Put out a Class A fire by lowering its temperature or by coating the burning combustibles.	Wood Paper Cloth Rubber Plastics Rubbish Upholstery	Water*[1] Foam* Multipurpose dry chemical[4]
	**For Flammable Liquids** Put out a Class B fire by smothering it. Use an extinguisher that gives a blanketing, flame-interrupting effect; cover whole flaming liquid surface.	Gasoline Oil Grease Paint Lighter fluid	Foam* Carbon dioxide[5] Halogenated agent[6] Standard dry chemical[2] Purple K dry chemical[3] Multipurpose dry chemical[4]
	**For Electrical Equipment** Put out a Class C fire by shutting off power as quickly as possible and by always using a nonconducting extinguishing agent to prevent electric shock.	Motors Appliances Wiring Fuse boxes Switchboards	Carbon dioxide[5] Halogenated agent[6] Standard dry chemical[2] Purple K dry chemical[3] Multipurpose dry chemical[4]
	**For Combustible Metals** Put out a Class D fire or metal chips, turnings, or shavings by smothering or coating with a specifically designed extinguishing agent.	Aluminum Magnesium Potassium Sodium Titanium Zirconium	Dry chemical extinguishers and dry powder compounds only.

*Cartridge-operated water, foam, and soda-acid types of extinguishers are no longer manufactured. These extinguishers should be removed from service when they become due for their next hydrostatic pressure test.

Notes:

(1) Freezes in low temperatures unless treated with antifreeze solution, usually weighs over 20 pounds, and is heavier than any other extinguisher mentioned.

(2) Also called ordinary or regular dry chemical (solution bicarbonate).

(3) Has the greatest initial fire-stopping power of the extinguishers mentioned for Class B fires. Be sure to clean residue immediately after using the extinguisher so sprayed surfaces will not be damaged (potassium bicarbonate).

(4) The only extinguishers that fight Class A, B, and C fires. However, they should not be used on fires in liquefied fat or oil of appreciable depth. Be sure to clean residue immediately after using the extinguisher so sprayed surfaces will not be damaged (ammonium phosphates).

(5) Use with caution in unventilated, confined spaces.

(6) May cause injury to the operator if the extinguishing agent (a gas) or the gases produced when the agent is applied to a fire are inhaled.

Figure 2-1 The symbols in this table are placed on fire extinguishers to indicate the types of fires that they are designed to be used on.

portable fire extinguishers must be readily available in a fire emergency. Extinguishers must be installed close to all potential fire hazards (Figure 2-3). The extinguishers must contain the proper type of extinguishing agent for those hazards, and they must be large enough to protect the designated area. The fire hazards existing in a shop must be identified and evaluated, to verify that the proper numbers and types of fire extinguishers are installed at the correct locations.

Take the following steps before you attempt to extinguish any fire. For reasons of brevity concerning the legal aspects of OSHA, it is the federal government's law enforcer for

industrial-safety matters. Employers are motivated to adopt and use safe working procedures through OSHA's strict enforcement of the regulations. Safety violators receive harsh penalties and fines. You can find a complete list of OSHA's proven safety methods, practices, and regulations in one convenient resource called the Code of Federal Regulations:

1. Evaluate the size of the fire. A fire in its beginning stages is called an *incipient fire*. A fire is classified as incipient (start-up) if it covers an area no larger than 2 to 4 feet square, has flames less than 2 feet in height, and produces low levels of smoke. Fire extinguishers can be effective for extinguishing or suppressing this size of fire. But it is not safe to use a fire extinguisher after a fire passes beyond the incipient stage. The length of time that a fire remains in the incipient stage is usually quite brief. If the fire goes beyond the start-up stage, the only course of action is to evacuate the building or facility and call the fire department.
2. Locate the exits and the escape routes you will need in an emergency evacuation. To prevent yourself from becoming trapped in a serious situation, keep the locations of the exits in mind as you fight the fire.
3. Determine which way the flames are moving, and approach the fire from the opposite direction. The flaming side of the fire radiates too much heat, and the fire could overtake you before you have a chance to escape. By attacking the fire from the opposite side, you will be safer; you will also be able to get closer to the combustion zone of the fire.

HANDLING HEAVY OBJECTS AND MATERIALS

Material handling (moving materials from one place to another) is a concern for all occupations because this task has serious hazards associated with it. Every workplace requires some form of material handling. In a motorcycle service department, you may be required to remove or lift complete engine assemblies, packages of supplies, or pieces of equipment. Poor material-handling techniques and practices can lead to a variety of injuries including back injuries, twisted or sprained muscles and joints, hand injuries, and foot injuries. Improper material-handling procedures can also result in damaged equipment, tools, and facilities. Because they happen so frequently, back injuries are the most costly of all injuries in terms of medical costs and lost work time. Back injuries are often the result of poor material handling and improper lifting. Most back injuries occur when workers either do not know, or choose to ignore, the proper lifting techniques (Figure 2-9). Back injuries can also result from preexisting back problems that are worsened by lifting. Some workers know how to lift heavy items correctly but ignore proper techniques in order to get the job done faster. To prevent injuries, always use the following lifti.

USING PERSONAL PROTECTIVE EQUIPMENT (PPE)

To protect yourself from injuries in the workplace, use **personal protective equipment (PPE)** when appropriate. PPE includes items such as dust masks, safety glasses, gloves, and special footwear (Figure 2-10). Remember that any task can be hazardous, even if the equipment is operated properly and all safety procedures are followed. Always wear PPE wherever the potential for injury exists. The type of PPE you need varies depending on the tasks you perform.

Protecting Your Eyes and Face

Protective **safety glasses** and **goggles** (Figure 2-11) are available in a wide variety of styles to meet specific needs. Safety glasses with side shields provide more protection from impact and flying particles. Most safety glasses and goggles may be worn alone or over a worker's own prescription eyeglasses. Improper material-handling procedures can also result in damaged equipment, tools, and facilities. Because they happen so frequently, back injuries are the most costly of all injuries in terms of medical costs and lost work time. Back injuries are often the result of poor material handling and improper lifting. Most back injuries occur when workers either do not know, or choose to ignore, the proper lifting techniques (Figure 2-9).

Splash goggles protect the eyes from dust, particles, and chemicals. They may contain ventilation holes to provide air circulation. Welding glasses

have tinted or darkened lenses to protect the eyes from the bright flashes of welding arcs. A face shield is a cap-like device that holds a clear plastic shield over the face. The face shield protects the entire face from chemical splashes and flying particles.

Fuel-Injection Diagnostic Testers

Many people wear contact lenses as a replacement for glasses. Contact lens wearers must determine when it is appropriate for them to wear their contacts based on their working environment. Wearing contact lenses is not recommended if the workplace has significant amounts of flying dirt or dust particles, or if chemical fumes are present. Remember that the only function of contact lenses is to correct your vision. They do not provide any eye protection from dust, impact, or splashes. You must still wear eye protection devices such as goggles or face shields over your eyes whenever your activity warrants such protection. Improper material-handling procedures can also result in damaged equipment, tools, and facilities. Because they

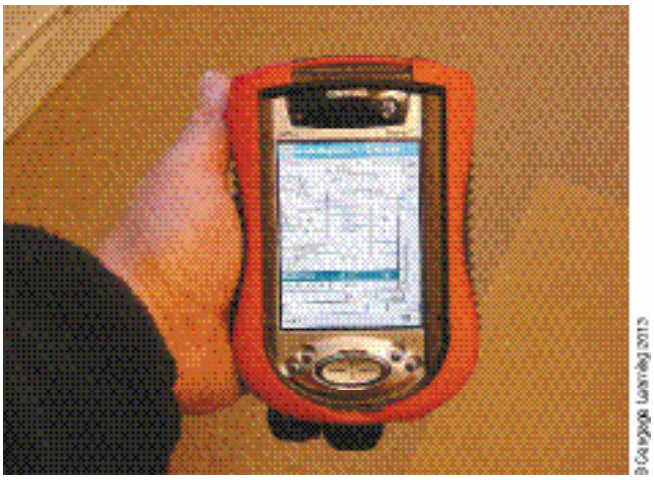


Figure 2-58 A typical bench grinder has a grinding wheel as well as a wire brush attachment.

happen so frequently, back injuries are the most costly of all injuries in terms of medical costs and lost work time. Back injuries are often the result of poor material handling and improper lifting. Most back injuries occur when workers either do not know, or choose to ignore, the proper lifting techniques (Figure 2-9).

Sometimes, even with the best safety practices, people somehow get foreign objects in their eyes. Many shops have eye-wash stations or safety showers (Figure 2-12) that should be used whenever you or someone else has been sprayed or splashed with a chemical such as battery acid, fuel, or cleaning solvent. Have someone contact a doctor and get immediate medical attention under these conditions as well.

Protecting Your Lungs

Respiratory-protection devices can prevent you from inhaling harmful dusts, gases, or vapors. Any employee whose work environment exposes them to chemical fumes, dust, or any other irritants in the air should wear the appropriate respiratory protection. A typical dust mask is a small, fabric-like filter with straps that slip over the face to cover the nose and mouth. Dust masks are designed to shield the mouth and nose from dust particles. They do not filter out vapors, fumes, or gases.

Respirators (Figure 2-13) are more substantial devices than masks. Firefighters use a form of respirator device when they are called upon to enter a burning building. Respirators are made of heavy plastic, metal, and safety glass. The firefighter's version is nonflammable and insulates the user from the high temperatures of a fire. All respirators have their own oxygen supply. Because the person using the respirator does not breathe any of the smoke, fumes, vapors, or toxic gases that might be present in the air, the respirator provides the best respiratory protection available.

Protecting Your Hearing

Question: How can you tell that you are in a high-noise area without using a sound-level meter? If another worker is standing three feet away and you cannot have a conversation unless you shout, the work area is too noisy. Hearing protection should always be worn in areas with a high noise level. If you work eight hours a day in a high-noise environment without wearing hearing protection, you will most likely experience a hearing loss over a period of years. If the noise level is extreme, you may suffer a hearing loss more quickly. You should always wear **earplugs** or a **headset** (Figure 2-14) in noisy areas or when using noisy tools.

Summary

- It is very important to understand the importance of safety and accident prevention in a motorcycle shop environment.
- You should know the basic principles of personal safety.
- There are procedures and precautions for safety when using tools and equipment.
- You must maintain a safe working area in a service shop environment.
- There are laws concerning hazardous wastes and materials including right-to-know laws.
- You have rights as an employee and/or student to have a safe place to work.

Chapter 2 Review Questions

1. List the three elements of the fire triangle.
2. True or False? A Class B fire involves live electrical equipment.
3. Name the federal agency that publishes and enforces safety standards for business and industry.
4. What are some of the key safety areas of primary concern in a motorcycle service department?
5. What type of fire is created by a chemical reaction with combustible materials?
6. Safety is an _____ that helps you prevent injuries to yourself and others.
7. What are two types of electrical power sources?
8. The letters PASS are used as a fire safety acronym. What do they stand for?
9. To prevent foot injuries, it is a good idea to wear what type of shoes?
10. When an engine is running, it creates exhaust gases that are hazardous if inhaled. Name the most dangerous of these gases.

Glossary

A

AC: Abbreviation for "alternating current," which is electricity that reverses direction and polarity while flowing through a circuit. Example: 110 volts AC in a household reverses direction and polarity 60 times per second (60 Hz). See Alternating current.

Accelerator pump: A small pump that enriches the fuel-and-air mixture during acceleration.

Acorn nut or cap nut: A nut with a finished or plated surface often used to cover the threaded end of a bolt or stud.

Active combustion: The result of a chain reaction of burning molecules accelerating and the chemical conversion that causes heat to be released very quickly.

Active energy: Energy in use or motion. Also known as kinetic energy.

Additives: Chemicals used in the manufacturing of oil to improve its operating qualities.

Adjustable wrenches: Wrenches that have movable jaws that allow adjustment to multiple sizes. (Also called crescent wrenches.)

Air-cooled engine design: An engine designed to be cooled by air.

Air cutoff valve: A system within many carburetors that richens the fuel mixture on deceleration to prevent engine backfiring or popping.

Air filters: Components used to filter the incoming air to the carburetor.

Air mixture screw: A screw that allows an increase or decrease of air into a slow speed circuit of a carburetor.

Air ratchet: A tool to remove nuts and bolts with the assistance of high air pressure.

Allen wrench: A six-sided male-end wrench.

All-terrain vehicle (ATV): A separate branch of the motorcycle industry family tree; they are available in a variety of sizes and styles.

Alpha-N: A type of fuel injection system that uses the angle of the throttle butterfly and engine rpm to determine the amount of fuel required by the engine.

Alternating current (AC): The flow of electrons, first in one direction, and then in the opposite direction.

Alternator: An AC "generator" that uses magnetic induction to produce electricity. A revolving magnet and stationary stator windings are used. The current produced is AC.

American National Standards Institute (ANSI): An organization in the United States that sets technical standards.

American Petroleum Institute (API): One of two general automotive agencies created to test, standardize, and classify lubricating oils.

Ammeter: A tool used to measure amperes.

Amp: A measurement of electric current.

Amperes: Commonly called "amps," which are electrical units of current flowing through a circuit (similar to gallons per minute of water through a hose).

B

Babbitt bearings: *See* Plain bearings.

Backlash: The play or loose motion in a gear due to the clearance between two opposing gears.

Baking soda: A household product used to neutralize sulfuric acid.

Ball bearings: The most popular bearing used on motorcycles because they provide the greatest amount of friction reduction and have the ability to handle both axial and radial loads.

Ball-peen hammer: A hammer that has two opposing striking surfaces: a flat-faced surface and a rounded surface.

Base carburetor: The carburetor with the idle adjustment screw on a multi-carbureted engine.

Base circle: The area of the camshaft that forms a constant radius from the centerline of the journal to the heel.

Basic hand tools: The common tools that are found in almost every workshop toolbox, which includes screwdrivers, hammers, pliers, wrenches, and socket sets.

Battery: An electrochemical device that converts chemical energy to electric energy. Used to store electrical power to supply uninterrupted energy for an electrical system.

Battery acid: The fluid contained in batteries that creates a chemical reaction that allows a battery to function.

Battery conductive analyzer: A tool to measure a battery's condition.
Battery load tester: A tool used to test the condition of a battery.
Beam-type torque wrench: A wrench to measure torque using a beam bending in response to the torque applied.
Bearing: Friction-reducing device that also reduces free play between shafts to allow for proper spacing and supports different types of loads.
Bench test: Isolated component inspection.
Bleeding: The method used to remove air bubbles from oil lines.
Block diagram: A more precise schematic of an electrical subsystem used to assist a technician with diagnosis of an electrical complaint.
Bolt: A metal rod with external threads on one end and a head on the other. A bolt may also be called a cap screw.

C

California Air Resources Board (CARB): The "clean air" agency of the state of California.
Cam ground: Process of machining that makes an oval piston round after it reaches its operating temperature.
Camshaft: Component used to change rotary motion to reciprocating motion.
Camshaft drive tensioner: Component used to keep the proper tension on the cam chain or cam belt.
Camshaft lift: The distance that the valve actually moves away from the cylinder head.
Capacitor or condenser: A component, which in a discharge state, has a deficiency of electrons and will absorb a small amount of current and hold it until discharged again.
Carbon dioxide (CO_2): The result of complete combustion.
Carbon monoxide (CO): A colorless, odorless, poisonous, and deadly gas that results from partially burned fuel or fuel that is not completely burned during the combustion process.
Carburetor: A device used to mix the proper amounts of air and fuel together.
Carburetor synchronization: The process of balancing the output of two or more carburetors so that the amount of air-and-fuel mixture drawn through each one is equal.
Castle-headed nut: A nut that allows a cotter pin to be installed through a nut and bolt to prevent loosening.
Catalyst: A means to speed up the chemical reaction of something without undergoing any change itself.
Centrifugal clutch: A clutch that uses the engine's rpm to engage and disengage it.
Centrifugal oil filter: A type of oil filter that uses centrifugal force to clean the engine oil.
Chamfered: A process that removes sharp edges of the port to help keep the piston ring from catching as it moves up and down in the cylinder.
Choke plate cold start system: A type of cold start device used on older carburetors.
Circuit: Composed of three items: a power supply, load, and completed path.
Circuit breaker: A heat-activated switch that interrupts current when overloaded. A circuit breaker can be reset and replaces the function of a fuse.

D

Dampers: Components used to convert the kinetic (bouncing) energy into heat by utilizing friction and oil flow resistance.
DC: Abbreviation for "direct current," which means that the current will only flow in one direction—from positive to negative (conventional theory). *See* Direct current.
de Carbon shock: A type of damper that uses nitrogen gas in a separate chamber to keep the damper oil from foaming.
Detonation: A condition in which, after the spark plug fires, some of the unburned air-and-fuel mixture in the combustion chamber explodes spontaneously, set off only by the heat and pressure of the air-and-fuel mixture that has already been ignited.
Diagnostics: The process of determining what is wrong when something is not working properly.
Direct-drive transmission: A type of transmission that has power flow entering on one shaft and leaving on another shaft of the same axis.

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