



TECHNICAL REPORT

J282

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AUTOMOTIVE GASOLINE PERFORMANCE AND INFORMATION SYSTEM—SAE J282

SAE Recommended Practice

Report of Fuels and Lubricants Technical Committee approved December 1971. Conforms to ASTM Special Technical Publication STP 510.

The purpose of the Automotive Gasoline Performance and Information System¹ is to provide a set of consumer-oriented performance standards for motor gasolines, with understandable symbols that indicate to the consumer the characteristics of the product and the level of its performance regardless of season or location. While the system was developed primarily for gasolines used in passenger cars and light trucks, it is generally applicable to gasolines used in other vehicles and equipment.

Background—Individual proposals by cities and states relative to posting of gasoline quality and a specific request for direct assistance resulted in cooperative actions by the Society of Automotive Engineers (SAE), the American Society for Testing and Materials (ASTM), and the American Petroleum Institute (API) to develop a consumer-oriented system that would provide information about the performance of gasolines. In developing this system, consumer, government, petroleum, and automotive groups were consulted to provide a firm foundation for nationwide acceptance.

The complex relationship between gasoline composition and the engine performance has long been the subject of intensive study. The committees of SAE, ASTM, and API reviewed and consolidated the technical information available to develop this system.

The following guide lines were used in developing the system:

1. The system must be based on technically sound concepts and definitions.
2. The technical definition in the system must be adaptable to the changing fuel requirements of engines and availability of fuels.
3. The most significant performance parameters should be identified to the consumer by a descriptive symbol.
4. The symbol system must be simple, understandable, and invariant to the consumer with time and location of use.
5. The symbol system also must be useable by both the automotive and petroleum industries on a national basis.

The responsibilities for developing the system were as follows:

1. SAE to identify the most important performance requirements of gasolines.
2. ASTM to define these requirements and the methods of testing in their gasoline specifications.
3. API to develop a consumer-oriented descriptive symbol and related consumer information based on the efforts of SAE and ASTM.

The System

Identification of Performance Requirements—Numerous gasoline performance requirements (see SAE J312b) were considered. Four performance requirements were identified as the most significant from a consumer standpoint. Listed in the order in which implementation might proceed, they are:

1. **ANTI-KNOCK PERFORMANCE**—If the antiknock performance of a gasoline is too low for a given engine, it will knock. Excessive knock may cause engine damage. The method selected to express antiknock performance must relate to actual performance in vehicles.
2. **EXHAUST EMISSION CONTROL SYSTEM COMPATIBILITY**—Some future exhaust emission control systems may be incompatible with lead and other as yet undefined constituents in gasoline. Since these exhaust emission control systems are at present only in development, an exact definition of this performance requirement cannot be given now. However, because of the association drawn between the use of lead in gasoline and its effect on some developmental automotive emission control systems, the lead content of gasoline has become an important matter of interest.

3. **INDUCTION SYSTEM CLEANLINESS**—This is the ability of a gasoline to keep engine induction system components such as carburetors, intake manifolds, and intake valves clean and in good working order.

4. **DRIVEABILITY PERFORMANCE**—Driveability of vehicles relates to starting, warmup, acceleration, vapor lock, stalling, etc., which are affected by gasoline volatility.

Definition of Performance Requirements

1—The definitions and test methods of antiknock performance (Index) are set forth in ASTM D 439, Specifications for Gasoline. Appropriate excerpts from these specifications plus descriptive comments on applications prepared by API are listed in Table 1.

TABLE 1—ANTI-KNOCK REQUIREMENTS FOR GASOLINES

Number Designation	Application	Antiknock Index ^a Minimum (RON + MON)/2
1	For cars with low antiknock needs	<87
2	Meets antiknock needs of most 1971 and later model cars	87 ^b
3	For most 1970 and prior model cars designed to operate on "regular" gasoline, and for 1971 and later model cars that require higher antiknock performance than provided for in "designation 2."	89 ^c
4	A "mid-premium" or "intermediate" designation which meets the lower antiknock needs of some cars designed to run on "premium" gasolines and the higher antiknock needs of some cars designed to run on "regular."	91.5
5	For most 1970 and prior model cars with high compression ratio engines designed to run on "premium" gasolines, and for later model cars with high compression ratio engines.	95 ^c
6	For cars with high compression ratio engines designed to run on "premium" gasoline, but requiring higher antiknock performance than "designation 5."	97.5

^aOne-half the sum of the Research octane number (RON) and Motor octane number (MON): The antiknock index of gasoline for use in areas where altitude is greater than 2000 ft (600 m) may be reduced one-half (0.5) number for each succeeding 500 ft (150 m) but not to exceed a total of three numbers.

^bIn addition, the minimum Motor octane number must be 82.

^cIn the following states, this minimum may be reduced by one-half (0.5) number: Arkansas, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin and Texas west of 99° longitude.

Antiknock Index, (RON+MQN)/2, is related to actual road anti-knock performance of cars and is the currently accepted method of expressing this characteristic. Its value is obtained by averaging octane ratings from two laboratory engine tests known as the Research method (ASTM D 2699) and the Motor method (ASTM D 2700). The Antiknock Index may be changed in the future to properly describe fuel requirements of new engines.

The minimum Antiknock Index for each number designation is corrected for altitude. Such a correction exists in practice but is not provided for by the Research method, nor the Motor method.

2—Recognizing that gasolines having different lead contents are now available to the consumer, the lead content of "unleaded," "low leaded," "leaded" gasolines as defined in ASTM D 439 are listed in Table 2.

3 and 4—At the present time, there are no standardized performance tests to evaluate engine induction system cleanliness and vehicle driveability. Work is currently under way to develop a set of performance tests.

¹This SAE Recommended Practice is intended as a guide toward standard practice, but may be subject to frequent change to keep pace with experience and technical advances. Hence, its use where flexibility of revision is impractical is not recommended.

TABLE 2—DEFINITION OF LEAD CONTENT OF GASOLINE

Unleaded	— No intentional addition of lead compounds. May not contain more than 0.07 ^a g of lead per gallon (0.018 g/l).
Low Lead	— May contain lead compounds up to 0.5 g of lead per gallon (0.13 g/l).
Leaded	— May contain lead compounds up to 4.2 g of lead per gallon (1.1 g/l).

^aThis value is subject to change as more information is obtained on the effect of lead on potential catalytic converter system under development.

The Gasoline Symbol—The Automotive Gasoline performance and Information System provides a symbol for display on gasoline dispensing equipment. The symbol is also suited for use in owners' manuals so the manufacturer can advise the consumer as to the performance requirements of the gasoline needed. The symbol provides space for the four performance requirements, but initially describes only two: antiknock performance and lead content. The unused spaces are reserved for induction system cleanliness and driveability Performance. Later the space to show lead content will be used to show exhaust emission control system compatibility.

Examples of symbols are shown in Fig. 1. Fig. 1A indicates an unleaded gasoline with number designation 2 (minimum Antiknock Index 87). Fig. 1B indicates a leaded gasoline with number designation 5 (minimum Antiknock Index 95).

Recommended minimum sizes for the symbol when used on retail gasoline dispensing equipment are:

Conventional Pumps	Blending Pumps
Diameter of circle — 2 in (50mm) Diameter of inner circle — 1-3/8 in (35mm) Lettering — 18 point Number — 72 point	Size reduced from the minimum size to 1-1/16 in (27mm) minimum proportionally

Symbols may be black-on-white or white-on-black, whichever gives best visibility.

Maintenance and Modification—The Automotive Gasoline Performance and Information System is designed to be adaptable to changing engine-gasoline relationships with minimum confusion to the consumer. As these relationships change, modified or new performance parameters may be needed which in turn may require the development of new performance tests and possible revisions of the performance symbol. Continuous planning and coordination of the efforts of the three organizations will be necessary to keep the system current with changing engine/fuel relationships. Therefore, the combined SAE/ASTM/API task force has been established as a permanent body called the Automotive Gasoline Performance and Information System Committee composed of the individuals holding the following nine positions plus no more than three members at large:

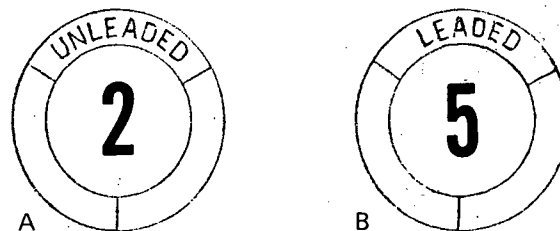


Fig. 1

Chairman, SAE Fuels and Lubricants Technical Committee
Chairman, SAE F & L Tech. Comm. Subcommittee 1, Fuels
Member, SAE F & L Tech. Comm. (no more than two members from the same industry)
Chairman, ASTM Technical Division A on Gasoline
Chairman, ASTM Tech. Div. A, Section 1, Specifications
Member, ASTM Tech. Div. A (no more than two members from the same industry)
Director, API Division of Marketing
Chairman, API Motor Fuels Subcommittee
Member, API Staff
Members at large—up to three to provide participation from and balance among government, military, industry, and educational institutions.

Term of membership for any member shall not exceed 5 years unless the committee judges the expertise of or position held by the individual to be essential to the performance of the committee. Suggested changes and comments are solicited and should be addressed individually or collectively to:

Society of Automotive Engineers
Chairman, SAE Fuels and Lubricants Technical Committee
Two Pennsylvania Plaza
New York, New York 10001
American Society for Testing and Materials
Chairman, ASTM Technical Division A on Gasoline
1916 Race Street
Philadelphia, Pennsylvania 19103
American Petroleum Institute
Director, API Division of Marketing
1801 K Street N.W.
Washington, D.C. 20006

The interested consumers are urged to familiarize themselves with the following documents that have been prepared on gasoline:
SAE Information Report J312b, Automotive Gasoline.
ASTM Standard D 439, Specifications for Gasoline.
API booklet, "Questions and Answers About Gasoline".

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