BSM # 821 B

MOTOR VEHICLE FUEL AND FUEL ECONOMY

GASOLINE

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1. GENERAL

1.01 With few exceptions motor vehicles operated in Bell System fleets are driven by internal combustion engines using gasoline as fuel. Accordingly fuels suitable for use in diesel-type engines are not included in this Section.

2. SAFETY PRECAUTIONS

2.01 As gasoline is classified as a flammable liquid all necessary precautions as required by National and Local Authorities should be observed in its handling and storage and when dispensing it from storage tanks to motor vehicles.

2.02 Only approved safety cans shall be used when storing or transporting small quantities of gasoline for use in portable gasoline engine-driven equipment.

2.03 Gasoline spilled while servicing a vehicle should be immediately wiped up or flushed down with water. If any considerable quantity is involved the necessary precautions should be taken to prevent its ignition during the flushing process. Local fire and safety regulations may apply to its disposal and such should be followed.

2.04 Most gasolines used for motor vehicle engine fuel contain Tetraethyl Lead. Due to the hazard of lead poisoning such gasolines should not be used for cleaning parts or washing the hands or other parts of the body.

3. DESCRIPTION

3.01 Gasoline is a highly complex, volatile liquid produced from crude oil by several methods.

3.02 Generally, three types of gasoline are produced as follows:

(a) ***Straight Gasoline*** is a gasoline obtained by distillation of petroleum where the process is stopped when the gravity of the gasoline has reached a predetermined point. Frequently the octane rating of straight gasoline is too low for its satisfactory use in a motor vehicle engine.

(b) ***Natural Gasoline*** may be produced by a process of liquefying certain constituents in natural gas. This gasoline is too volatile for general use and is usually blended with other products to produce a mixture that can be used safely.

(c) ***Cracked or Synthetic Gasolines*** are similar to straight gasoline, but differ somewhat chemically. They are obtained by processing portions of the heavier fractions of the distillation of petroleum so that some of these fractions break down and distill off in the gasoline temperature range.

3.03 Generally, in order to provide a suitable engine fuel, commercial gasolines are blends of two or more of the three types referred to in Paragraph 3.02.

3.04 While various factors such as gravity, volatility, vapor pressure, gum residues, corrosion, distillation temperatures, etc, enter into the requirements for a specific grade of gasoline, anti-

knock characteristics of the fuel and volatility have become increasingly important, due to modern engine design.

3.05 The knock characteristics of a gasoline are indicated by an octane number scale. Most gasolines have Tetraethyl Lead added to improve their octane number.

3.06 There are two recognized laboratory engine test methods of determining the octane number of a specific fuel. However, essentially the octane number represents the relationship between the knock characteristics of the specific fuel and those of a standard reference fluid of known composition. As the tendency of an engine to knock may vary with engines of the same production run and depends on many things such as climatic conditions, spark adjustment, carburetor and engine design, the complete knock characteristics of the fuel can only be determined by running the fuel in the engine under driving conditions.

3.07 Commercial gasolines are usually graded ***Premium, Regular*** and ***Third Grade.*** While actually the octane ratings will vary in different parts of the country and with the customers' requirements normally they will have minimum research octane ratings of about 96, 87 and 85, respectively.

4. FUEL ECONOMY

4.01 In order to secure fuel economy in the day-to-day operation of a motor vehicle, it is not sufficient to have it in good mechanical condition but certain driving features detrimental to fuel economy must be considered by the operator with a view towards their avoidance.

(a) Where frequent stops are encountered fast acceleration from the stops can mean ten per cent or more difference in gasoline consumption and therefore fast acceleration should be avoided.

(b) Continued accelerating and decelerating while driving increases the fuel consumption due to the fact that each time the accelerator is depressed the pump in the carburetor operates, spraying extra gasoline into the air-gas fuel mixture. Driving at a steady speed avoids this injection of additional fuel and aids fuel economy.

(c) Racing the engine when declutched introduces more fuel without any useful work being performed and should be avoided.

(d) The practice of holding the vehicle at a stop light on a hill by slipping the clutch rather than with the brake, adversely affects fuel economy and clutch wear and should be avoided.

(e) The fuel consumed in a given period by an idling engine is much less than when operating under load for an equal time. However, total fuel consumption will be appreciably increased if the idle time is a big part of the total. Thus, a light-duty vehicle in start-stop service, with the engine being shut off at each stop, may average 10 miles per gallon or better. However, if the engine is allowed to idle at each stop, fuel consumption may drop to 6 to 8 miles per gallon or lower. The harmful effect on total fuel cost can be substantial for even a small fleet over a period of a year.

4.02 In addition to the operator's observance of the driving features discussed in Paragraph 4.01, it is essential that the engine ignition system and carburetor be maintained at high efficiency and that the necessary adjustments for climatic conditions and seasonal weather periods be observed.

4.03 While under certain specific local conditions, or in the case of certain passenger cars, it may be desirable to use a Premium grade fuel, there is no apparent economy in using that grade of fuel generally for Bell System fleet cars and trucks.

4.04 For most conditions the current model engines, particularly those used in trucks, will handle Regular grade gasoline satisfactorily and very little difference if any, in miles per gallon will be secured by use of the higher grade fuel.

4.05 Engines which knock on Regular grade gasoline can usually be improved and fuel economies secured by taking measures outlined in Paragraph 5.

5. ENGINE ADJUSTMENTS TO IMPROVE PERFORMANCE

5.01 Proper timing is important in securing economy and best performance with any particular engine and gasoline under the various driving conditions encountered. Mechanical condition of the various components of the ignition system should be checked for general wear and flaws. All such defects should be corrected and the spark set to suit the conditions encountered. A spark set too late will result in fuel waste and a spark too far advanced may raise the fuel octane number requirement in order to prevent damaging detonation or knock.

5.02 Improved carburetion will result in better engine performance and economy. Correct faulty or worn carburetor parts, poorly fitting gaskets, etc, and reduce carburetor settings to normal for conditions encountered.

5.03 Some carburetors have jets which are on the rich side. In some cases it may be practicable to change the jets and secure a mixture which will give satisfactory over-all operation without getting the mixture too lean.

5.04 The engine carburetor may have an accelerator pump with two or three richness settings which force corresponding quantities of gasoline into the engine when the accelerator is operated. Using the leanest practicable pump setting for a particular seasonal condition aids fuel economy.

5.05 Thermostats should be selected which will permit coolant temperatures, above 180 degrees. If they operate at too low a temperature, or become inoperative in service, fuel economy is adversely affected.

5.06 Weak spark plugs, spark plugs which leak compression or miss, or plugs which are too hot or too cold for the engine temperatures, adversely affect power and fuel economy. Plugs should be inspected, cleaned and points adjusted to proper spacing. Cracked or leaking plugs should be replaced.

5.07 Faulty operation of the distributor due to worn cam lobes, cracked plates, bent shafts, general wear, and faulty vacuum spark advance mechanism will all affect engine performance. In addition, breaker points should be clean, free from excessive pitting, have proper gap and should make flat contact with each other when closed.

5.08 A defective condenser may result in a weak spark affecting economy and performance. Generally when breaker points are replaced, replacement of the condenser is indicated.

5.09 Automatic chokes used on passenger cars should function properly for maximum economy. Check moving parts for proper operation. On trucks equipped with manual chokes, the choke should be used sparingly and restored to normal position as soon as possible after engine is started.

5.10 Dirty or restricted air cleaners block proper air entrance and enrich the gasoline-air mixture, thus wasting fuel. Oil bath air filters should not contain oil above the prescribed "oil level" line as this restricts the air flow.

5.11 The viscosities of engine oils and gear lubricants have a definite effect on fuel economy. In general, lighter oils where applicable result in less friction and better mileage is secured. However, on a worn engine, use of a lighter oil may result in greater oil loss.