

MICHIGAN DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT LABORATORY DIVISION/ MOTOR FUELS QUALITY

Gasoline Volatility Information

Gasoline is composed of a variety of ingredients that evaporate at different temperatures. The faster vaporizing components evaporate at lower temperatures than the slower vaporizing components. Michigan has established standards for gasoline volatility (ability to vaporize).

Gasoline with lower evaporation temperatures (more highly volatile) starts easier, warms up better and contribute less to deposits but would have more fuel losses and would be more likely to vapor lock. If the gasoline has too low a boiling temperature in may boil in fuel pumps, fuel lines or in carburetors at high operating temperatures. The vapor causes a decrease in fuel flow to the engine resulting in loss of power, rough engine operation or complete shut down of the engine.

Gasoline with higher evaporation temperatures (decreased volatility) wouldn't have the losses or vapor lock problems but would start harder and not warm up as easily with increased deposits and dilution of engine oil. Exhaust emissions could also increase. If the gasoline doesn't vaporize sufficiently it will be hard to start a cold engine, cause poor warm up and acceleration, and unequal fuel distribution to the cylinders.

To minimize the effects of these driving conditions gasoline specifications change from season to season and take into account geographic considerations. To minimize the effects of volatility on the formation of smog there are further limitations during the summer months.

Distillation Test

To ensure the proper gasoline is being sold for the season the Michigan Department of Agriculture and Rural Development checks the vapor pressure and the distillation temperatures after 10%, 50%, 90% and 100% (referred to as end point) of the fuel has evaporated.

Initial boiling point and 10% evaporative temperature effects cold starting ability, vapor lock and carburetor evaporative losses. 50% evaporative temperature effects evaporative losses and fuel economy, vapor lock, warm-up and cool weather driveability. 90% evaporative temperature and final end point boiling temperature effects spark plug fouling, dilution of engine oil, crankcase and combustion chamber deposits.

Distillation Range Limits

Month	Distillation Temperatures, °F, at 10 % Evaporated	Distillation Temperatures, °F, at 50% Evaporated	Distillation Temperatures, °F, at 90% Evaporated	Distillation Temperatures, °F, at End Point	Residue Volume %
January	122.	150.-230.	365.	437.	2.0%
February	122.	150.-230.	365.	437.	2.0%
March	131.	150.-235.	365.	437.	2.0%
April	158.	150.-250.	374.	437.	2.0%
May	158.	150.-250.	374.	437.	2.0%
June	158.	170.-250.	374.	437.	2.0%
July	158.	170.-250.	374.	437.	2.0%
August	158.	170.-250.	374.	437.	2.0%
Sept. 1-15	158.	170.-250.	374.	437.	2.0%
Sept. 16-30	158.	150.-250.	374.	437.	2.0%
October	131.	150.-235.	365.	437.	2.0%
November	131.	150.-235.	365.	437.	2.0%
December	122.	150.-230.	365.	437.	2.0%

*Transition months \geq greater than or equal to \leq less than or equal to

Because the fuel must stay within acceptable ranges it is critical that the gasoline not be cross-contaminated with other products during the distribution and storage process. Peddle truck and smaller deliveries are especially susceptible to end point violations because even small amounts of a heavier distillate such as diesel fuel may cause gasoline to fail the end point distillation range test.

Because winter specification fuel will not perform well during the summer months and visa verse it is important to ensure adequate inventory turnover to avoid non-compliant situations as the seasonal requirements change.

Vapor Pressure Test

The vapor pressure test is another measure of the fuel’s volatility. More volatile fuels vaporize more readily and create more pressure when measured. Less volatile fuels exert less pressure and evaporate more slowly. The vapor pressure of the gasoline is limited year round but more stringent limitations are in place during the summer months due to the higher ambient temperatures. In Livingston, Washtenaw, Oakland, Macomb, Wayne, St. Clair, Lenawee and Monroe counties even stronger limitations are placed on summertime vapor pressure to reduce the formation of ground level smog. Retailers must ensure adequate inventory turnover prior to June 1 for all fuels to avoid non-compliant vapor pressure situations.

Vapor pressure Limits

Month	Vapor Pressure (gasoline containing less than 9 volume % Ethanol)	Vapor Pressure (gasoline containing 9-10 volume % Ethanol)	SE Michigan Ozone area exceptions*	
			Without Ethanol	With 10% Ethanol
January	15.0 psi	16.0 psi		
February	15.0 psi	16.0 psi		
March	15.0 psi	16.0 psi		
April	13.5 psi	14.5 psi		
May	13.5 psi	14.5 psi		
June	9.0 psi	10.0 psi	<7.0 psi*	<8.0 psi*
July	9.0 psi	10.0 psi	<7.0 psi*	<8.0 psi*
August	9.0 psi	10.0 psi	<7.0 psi*	<8.0 psi*
September 1-15	9.0 psi	10.0 psi	<7.0 psi*	<8.0 psi*
September 16-30	13.5 psi	14.5 psi		
October	13.5 psi	14.5 psi		
November	15.0 psi	16.0 psi		
December	15.0 psi	16.0 psi		

*Reformulated gasoline may also be used.

≥ greater than or equal to ≤ less than or equal to

The Motor Fuels Quality Act can be referenced on the Internet at Legislature.Mi.gov . The standards for gasoline can be referenced on the Internet at: [Regulation NO. 564. Automotive Motor Fuel Purity, Additives, and Grading](#) Information for retailers on maintaining gasoline quality is also available at Michigan.gov/MDARD in the licensing and certification section.