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October 9, 2020

Attn: Rich Doenges
SEPA Responsible Official
Washington Department of Ecology
PO Box 47775
Olympia, WA 98504-7775

Dear Mr. Doenges,

I am a chemical engineer with 36 years of petrochemical industry experience, the last 24 of which I have worked as an independent analyst of global methanol markets. In 2004, I founded Methanol Market Services Asia (MMSA), a global consulting firm which provides business solutions to most major methanol manufacturers, consumers, traders, distributors, and other associated companies. MMSA was founded and remains headquartered in Singapore. Among its services, MMSA provides detailed analysis of Chinese methanol markets, including methanol demand and trade flows. In the course of my work with MMSA, I have traveled extensively to China to visit clients to understand how methanol is consumed and transacted in China. MMSA has permanent, Mandarin speaking staff in China also with extensive methanol market experience. I am in frequent contact with Chinese methanol market participants and regularly prepare independent reports on Chinese methanol markets.

I was engaged by the Port of Kalama (Port) to objectively review and comment on the State of Washington Department of Ecology's (Ecology's) Draft Second Supplemental Environmental Impact Statement (DSSEIS) prepared for a proposed Kalama Manufacturing and Marine Export Facility (KMMEF) and provide my opinions about the reasonableness of assumptions used in the report regarding behavior of methanol markets in China. Specifically, I was asked to comment on methanol market related assumptions used in the Emissions Sensitivity Model (ESM) developed by the report authors.

I affirm my genuine belief in the opinions expressed in this report. In submitting this report, I acknowledge my independence from the Port and their legal representatives. My engagement with the Port was not conditioned upon the arrival of a certain conclusion.

In summary, I identified several assumptions that would lead to an overstatement of the GHG impact of the KMMEF, and an understatement of the net emissions benefits of KMMEF. Specifically:

- A reference case assumption that 40 percent of the KMMEF would be used for fuels use in China
  - For several reasons, including current gasoline specifications, the current market locations of methanol's use as fuel, and the costs of transporting imported methanol for use in fuel applications, the assumption of 40 percent is too high.
  - Notably, the authors did not use MMSA China data in their analysis, instead

misinterpreting global-level MMSA information in a manner which overstates the potential for, and the impact of, displacing existing fuels use with methanol in China.

- A reference case assumption that KMMEF produced methanol would displace 60 percent of methanol produced by a coal-based methanol production process, 10 percent by a Chinese natural gas-based process, and 30 percent from imported methanol.
    - The choice of 60 percent is too low and is based on a methodology that is not clearly explained in the DSSEIS.

Following are details behind the findings above and suggestions for more appropriate assumptions for ESM reference case inputs.

Use of KMMEF methanol as fuel in China will be negligible

The use of methanol imported from overseas by Chinese parties as "fuel," including, as the DSSEIS posits, use of the methanol made at the KMMEF, is and will be negligible. While there is appreciable use of methanol in China for fuel that MMSA categorizes as "gasoline blending and combustion," "biodiesel," "dimethyl ether," and "methyl tert-butyl ether (MTBE)," these uses (which can all be considered fuel), are almost entirely supplied by domestically produced methanol. In fact, despite the large current size of imports into China, MMSA observes that essentially no overseas methanol is directly blended with gasoline, nor used in industrial boilers, nor used in cooking or heating applications in China. Assuming (as the DSSEIS did) that 40% of KMMEF's annual methanol production (1.4 million metric tons per year) would be used as fuel would require a Chinese methanol fuel demand many magnitudes higher than the existing market for overseas methanol demand into fuels (less than 30 thousand metric tons per year).

There are several reasons which drive and will continue to drive this market behavior in which methanol supply from overseas will not be used in fuel on any large scale. For one, Chinese authorities, in conjunction with state-owned refiners, are discouraging the use of methanol as a transportation fuel, especially in large consuming areas. The majority of gasoline consumed in China is in major urban areas near the coast, and current national gasoline specifications (attached) have strict limitations on methanol use (maximum 0.3 percent by weight). These specifications were developed by refiners who are not convinced of the overall benefits of methanol gasoline blends, including the incremental costs associated with preparing and handling such blends, as well as the lack of broad automotive industry support for methanol. As a result, there is no readily accessible market for methanol in coastal China (where most gasoline is consumed, and near the location where methanol imports from overseas arrive).

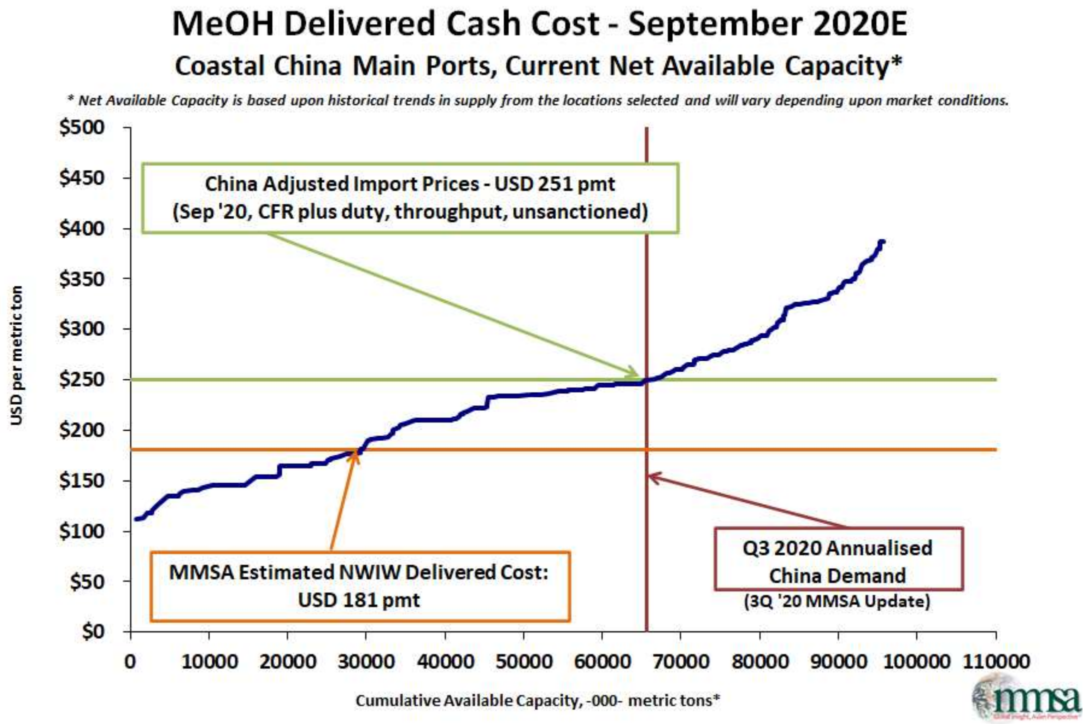
Chinese use of methanol in gasoline blends is highly fragmented, limited to inland provinces with high coal resources where gasoline supply had been limited, and transportation fuels are needed. In these regions, locally produced methanol is typically blended with gasoline in blends from 5 to 30 percent (M5 to M30), with M15 being the most common type. Note that, these domestic blenders are under pressure to close operations. Nationally there is clear intention by government officials, including the National Development and Reform Commission (NDRC) and the Ministry of Industry and Information Technology (MIIT) to limit the use of methanol in low-level blends with gasoline, and instead use M100, or pure methanol in transportation uses. These pilot programs are limited in size, restricted to a few thousand vehicles, are one of several alternative fueled vehicle experiments in China, and there is no guarantee of success in wider development. However, it should be noted that the motivation for this use is driven by having a superior fuel in several ways including GHG and other emissions improvements over conventional fuels. Because methanol and gasoline blends are not encouraged nationally, MMSA forecasts only modest growth in use of methanol in gasoline blends in China, and very modest growth of M100 use from an exceedingly small base of consumption. Note also that MMSA observes that the total amount of methanol used today as M100 is less than 20,000 metric tons per year (one day's output at the KMMEF).

Another factor which prevents overseas methanol from being used in gasoline blending is cost. The cost of shipping imported methanol from coastal ports inland via barge, rail, or truck is high. Costs to deliver methanol to these locations will make overseas methanol uncompetitive for these remote, and relatively small, markets. For instance, assume that methanol is delivered to coastal China at the current import market price of USD 230 per metric ton. The importer would then pay a duty of USD 12.65 per metric ton to import the product, then pay roughly USD 10 per metric ton to store and transfer the methanol to a delivery vessel (which for transport to provinces requiring methanol for gasoline blending, industrial boilers, and/or heating and cooking and other fuel uses would likely be a rail car). Rail costs would of course vary by province, and a typical rail cost would be USD 40 per metric ton. Whoever would sell such methanol would need to at minimum absorb these costs, and the consumer would pay a 13 percent Value Added Tax (VAT) on top of that. Accordingly, such a parcel of methanol delivered inland for use would be USD 292.65 before VAT and USD 330.69. The current domestic market price for methanol in inland provinces after VAT is CNY 1750, or approximately USD 258 per metric ton. There is no premium for imported methanol for inland province consumption. Thus, there is no chance that a sale of methanol product at USD 330.69 could be made in any substantial quantities in inland provinces for any use, let alone fuels uses. Methanol overwhelmingly substitutes for uses in coastal markets, not inland markets, which are where the majority of methanol for fuels uses resides. Thus, it is highly difficult to have imported methanol used in fuels markets in China.

In summary, because there is little overseas use of methanol in fuel applications in China, the DSSEIS reference case (and highest probability assumption) that 40 percent of KMMEF methanol would be used for fuels in China is highly overstated. The DSSEIS should utilize a reference case assumption for its EMS that 98 percent of the KMMEF methanol would displace olefins, and 2 percent would displace fuel. However, as the current ESM only allows assumptions to be inputted in 10 percent increments, I would suggest that the DSSEIS would utilize a reference case assumption for its EMS that 100 percent of the KMMEF methanol would displace olefins, and 0 percent would displace fuel.

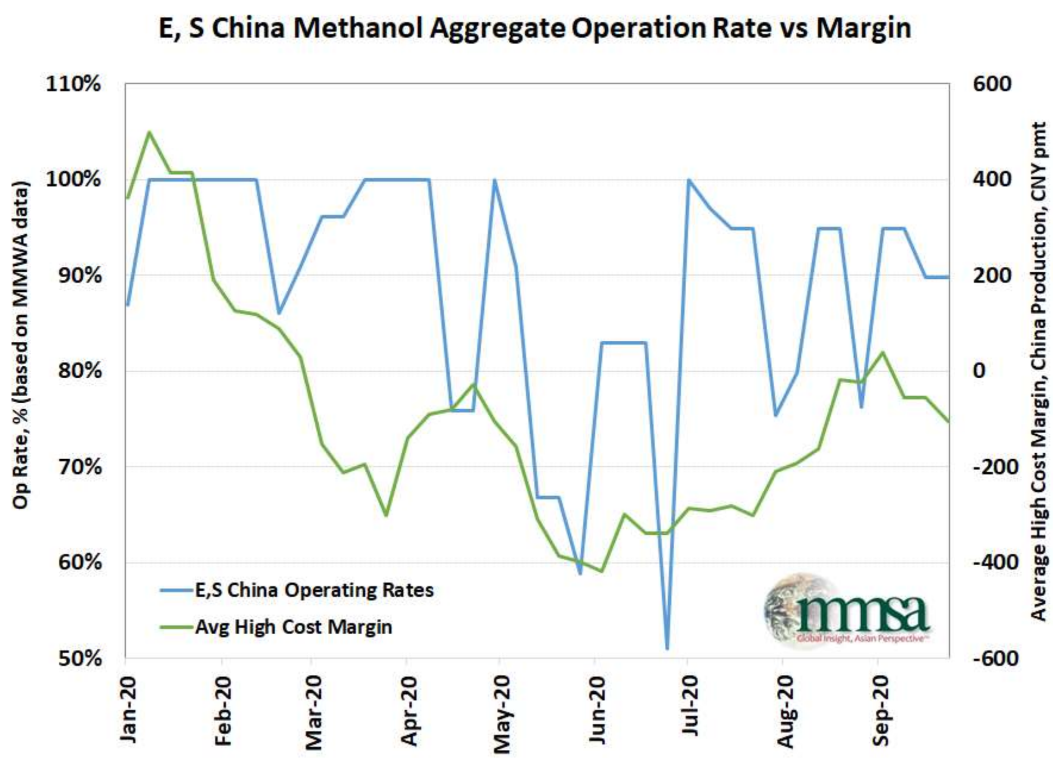
KMMEF displacement of methanol used in China

The cost curve of methanol supply to coastal China (below) provides a useful method to determine which facilities would be most cost competitive. The curve (blue line) is shown in the following chart, "MeOH Delivered Cash Cost – September 2020E." The curve is assembled by calculating the costs to produce and deliver methanol to coastal China at a given point in time, factoring feedstock, variable, fixed, and freight costs among others, from all available locations around the world (noting that not every location chooses to supply China at a given point in time). These costs are sorted from lowest to highest, and then plotted against their cumulative ability to supply coastal China. This chart is updated monthly by MMSA in its analysis of Chinese methanol markets.



In the chart, the blue line is a useful indicator to predict behavior of suppliers of methanol to coastal China, especially when compared to the horizontal orange and green lines shown. These horizontal lines represent the price at which methanol is sold. Producers whose costs to produce a ton of methanol exceed market prices (currently USD 240 – 250 per metric ton) will be selling at a loss and will very often shut down operations ("shut in") soon thereafter. These are called "high cost producers," and on this curve are almost exclusively coal and coke-oven gas-based supply and reside in the upper right-hand side of the curve. [Details behind each point on the cost curve can be made available by MMSA.] These high cost facilities will stop producing when prices collapse below their cost to supply material to avoid loss of profit. Overseas suppliers, including KMMEF, are in lower left-hand side of curve. These "low cost suppliers" are able to sell methanol at a profit. As they produce, they "push" the high cost methanol producers to the upper right-hand side of the cost curve, relegating them to negative profits and obsolescence. For reference, I have included a horizontal line (orange) where MMSA estimates the cost of delivery of methanol from KMMEF using current natural gas, duty, and freight estimates. KMMEF would be able to transport and sell methanol in coastal China at a more competitive cost than coal-based production (every point on the blue curve to the right of where the orange and blue lines intersect). Were KMMEF operational at designed capacity, and on this curve, it would move 3.6 million metric tons of coal based methanol production to the right of the curve, and expose that same 3.6 million metric tons to a point where they were higher on the curve than current pricing (green line). In this manner, overseas suppliers will force the closing of operations of high cost, coal-based production: by supplying market needs at lower costs.

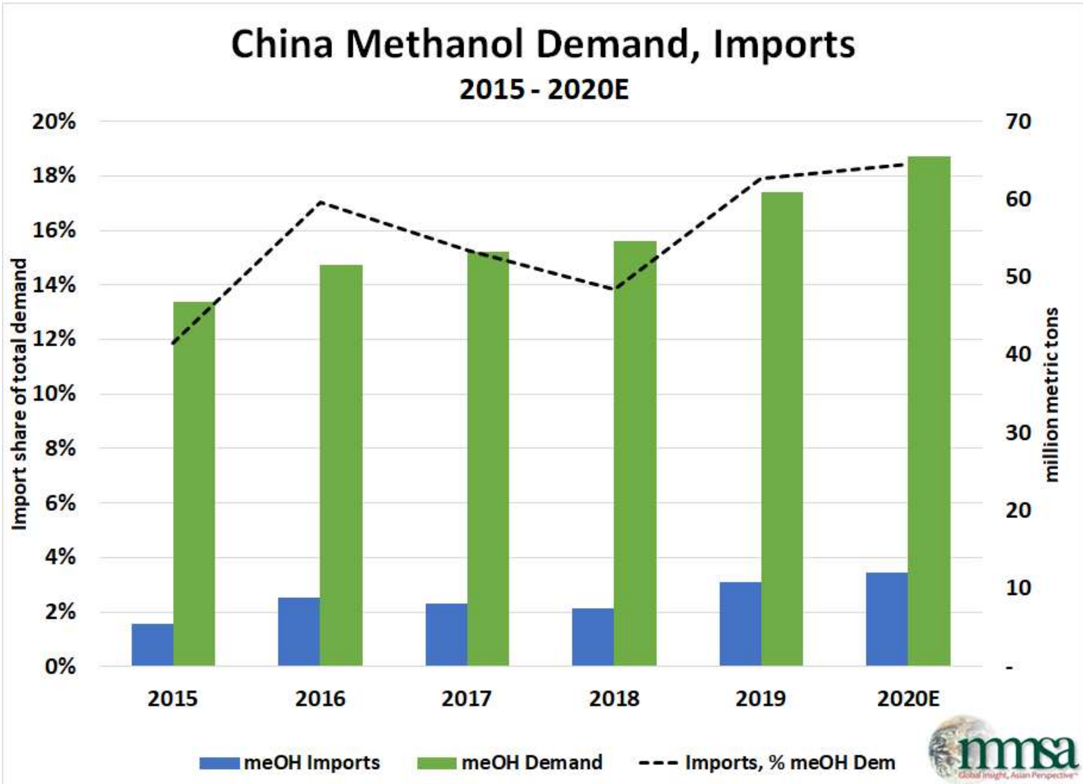
An example of how Chinese production slows as described by the cost curve is shown in the following chart, "E, S China Methanol Aggregate Operation Rate vs Margin." In the chart, historic operation rates are compared to the cash margin of production (price minus cost to produce) for high cost coal based methanol producers during a recent price turndown in China as the COVID-19 crisis impacted the country's economy, and then subsided. Operation rates are tracked by MMSA weekly and shown as the blue line in the chart. Cash margins are also calculated by MMSA weekly and compared in the green line in the chart. As cash margins became negative the coal to methanol facilities reduced production or shut off, leading to the lowered operating rates (as illustrated where the blue line drops from high levels of late March – early April 2020 to a near-halving of production by late June). As margins improved above zero, operating rates recovered.



Recall that these high cost producers which have shut in reside on the right-hand side of the cost curve. Considering this data, it is very likely that KMMEF, which will be on the left-hand side of the cost curve. will have the effect of displacing high cost coal to methanol supply in China, moving the marginal supply costs down, lowering cash margins for high cost producers, which will then shut down.

Another example showing how the MMSA cost curve describes market behavior in China can be gleaned from China import data. The chart "China Methanol Demand, Imports," compiles historic and forecast MMSA records of Chinese methanol demand and imports. Essentially all the imports into China come from supplies on the lower left-hand side of the cost curve, i.e. low cost overseas supply, like that of KMMEF. These supplies have garnered an increasing share of the methanol needed in China. This behavior underscores the trend in China toward use of methanol supplies like KMMEF.

Imports from low cost overseas imports have increased in 2020 at the cost of high cost production in China and have contributed to the lower operation rates. KMMEF would be one of these low cost methanol suppliers, and will be able to place product into China, not at the expense of the low cost overseas suppliers, but in conjunction with them, at the expense



of the high cost Chinese coal based methanol production.

In conclusion, KMMEF will push high cost capacity to the right of the cost curve. High cost capacity in China is coal based and will be first to shut down. Imports from low cost overseas supply will not suffer; it will displace high cost coal-based capacity in China. Accordingly, the "high coal case (80/20)" used in the EMS is not only more probable than reference case, it is my opinion that the most probable case (and so most appropriately applied in the DSSEIS's reference case) will be 100% displacement of coal derived methanol and a 0% replacement of gas-based methanol production.

Importantly, Chinese entities are planning to expand domestic coal-based production in the future. MMSA tracks the most likely projects (with many more under planning) for Chinese methanol production. These are listed in the following table.

The table is important in considering the impact of the KMMEF and similar facilities on coal-

METHANOL

Average Annual Capacities (-000- METRIC TONS) - New Facilities from 2019

COMPANY	CITY	PROVINCE		2015	2016	2017	2018	2019	2020E	2021E	2022E	2023E	2024E	2025E	
NORTHEAST ASIA															Capacity Add. '19 to '25E
CHINA															
Linquan Chemicals Co.		Anhui	Coal					200	300	300	300	300	300	300	100
Zhongan Lianhe		Anhui	Coal					1133	1700	1700	1700	1700	1700	1700	567
Shanghai Huayi Group	Qinzhou	Guangxi	Coal	----	----	----	----	----	----	860	1,720	1,720	1,720	1,720	1,720
Sinopec		Guizhou	Coal	----	----	----	----	----	----	----	----	1800	1800	1800	1,800
Heilongjiang Baotailong (parent company)		Heilongjiang	Coal					500	600	600	600	600	600	600	100
Hubei Yingde		Hubei	Coal	----	----	----	----	146	500	500	500	500	500	500	354
Yanzhou Coal Mining (Yankuang Group)		Inner Mongolia	Coal					450	900	900	900	900	900	900	450
Connell		Jilin	Coal	----	----	----	----	----	----	200	200	200	200	200	200
Hengli		Liaoning	Coal					417	500	500	500	500	500	500	83
Ningxia Baofeng Energy Co. Ltd (MTO Facility)		Ningxia	Coal						900	1800	1800	1800	1800	1800	1,800
Sinopec		Ningxia	Coal	----	----	----	----	----	----	----	----	----	----	1,800	1,800
Qinghai Kuangye (CTO)		Qinghai	Coal	----	----	----	----	----	----	----	----	1,800	1,800	1,800	1,800
Yanchang Zhongmei (Chinacoal) Yulin Nengyuan (Energy)	Yan'an	Shaanxi	Coal	----	----	----	----	----	----	900	1,800	1,800	1,800	1,800	1,800
Shenhua Group	Yulin	Shaanxi	Coal	----	----	----	----	----	----	----	----	----	1,000	2,000	2,000
Yanzhou Coal Mining (Yankuang Group)		Shaanxi	Coal					400	800	800	800	800	800	800	400
Tongmei Guangfa	Datong	Shanxi	Coal	600	600	600	600	600	600	600	600	2,400	2,400	2,400	1,800
Zhongtai Chemical		Xinjiang	Coal	----	----	----	----	----	----	----	900	1800	1800	1800	1,800
Zhejiang Petrochemical		Zhejiang	Coal	----	----	----	----	----	300	400	400	400	400	400	400

TOTAL - China				600	600	600	600	3,846	7,100	10,060	12,720	19,020	20,020	22,820	18,974

based production in China. Notably:

- Between 2019 and 2025E, MMSA estimates that over 18 million metric tons of new coal based methanol production capacity could issue.
- These are all coal-based facilities and will make methanol at higher costs than landed KMMEF costs.
- They are being built due to the growing use of methanol in China and the lack of low cost, gas-based supplies from overseas.
- Many of these facilities are still in planning and have not been built yet, and may be delayed or cancelled with projects like KMMEF
- In fact, companies like Sinopec have been actively seeking overseas natural gas base methanol supply as they would prefer this more cost-effective source of methanol

Thus, projects like the KMMEF will not only displace current production of methanol from coal, they will continue to do so in future years.

Based on my findings, the ESM assumptions for the reference and most probable case should be:

- 100 percent of the KMMEF methanol will be used for olefins, and zero percent for fuel
- 100 percent substituting Chinese coal-based methanol and zero Chinese natural gas based and other imports.

When I used the suggested assumptions as the reference case in the ESM provided, I found that the net global GHG emission reduction was significantly higher than reflected in the DSSEIS.

Sincerely,

Mark Berggren
Managing Director
Methanol Market Services Asia Pte. Ltd. (MMSA)

Attachments

Chinese Gasoline specifications

mmsa
Global Insight, Asian Perspective™

车用汽油(ⅥA)技术要求和试验方法 GB 17930—2016

Gasoline for Vehicle(VI A) Specification and Test Method GB 17930-2016

项目		质量指标 Specification			试验方法 Test Method
		89	92	95	
抗爆性:					
研究法辛烷值(RON)	不小于	89	92	95	GB/T 5487
抗爆指数(RON+MON)/2	不小于	84	87	90	GB/T 503、GB/T 5487
铅含量[a]/(g/L)	不大于	0.005			GB/T 8020
馏程:					GB/T 6536
10%蒸发温度/℃	不高于	70			
50%蒸发温度/℃	不高于	110			
90%蒸发温度/℃	不高于	190			
终馏点/℃	不高于	205			
残留量(体积分数)/%	不大于	2			
蒸气压[b]/kPa:					GB/T 8017
11月1日～4月30日		45～85			
5月1日～10月31日		40～65[c]			
胶质含量/(mg/100 mL):					GB/T 8019
未洗胶质含量(加入清净剂前)	不大于	30			
溶剂洗胶质含量	不大于	5			
诱导期/min	不小于	480			GB/T 8018
硫含量[d]/(mg/kg)	不大于	10			SH/T 0689
硫醇(博士试验)		通过			NB/SH/T 0174
铜片腐蚀(50 ℃,3 h)/级	不大于	1			GB/T 5096
水溶性酸或碱		无			GB/T 259
机械杂质及水分		无			目测[e]
苯含量[f](体积分数)/%	不大于	0.8			SH/T 0713
芳烃含量[g](体积分数)/%	不大于	35			GB/T 30519
烯烃含量[g](体积分数)/%	不大于	18			GB/T 30519
氧含量[h](质量分数)/%	不大于	2.7			NB/SH/T 0663
甲醇含量[a](质量分数)/% Methanol Content less than	不大于	0.3			NB/SH/T 0663
锰含量[a]/(g/L) Manganese content less than	不大于	0.002			SH/T 0711
铁含量[a]/(g/L) Iron content less than	不大于	0.01			SH/T 0712
密度[i](20 ℃)/(kg/m³)		720～775			GB/T 1884、GB/T 1885

Methanol, Iron, lead, and manganese blending is prohibited in gasoline for vehicle.

[a] 车用汽油中,不得人为加入甲醇以及含铅、含铁和含锰的添加剂。

[b] 也可采用 SH/T 0794 进行测定,在有异议时,以 GB/T 8017 方法为准。换季时,加油站允许有 15 天的置换期。

[c] 广东、海南全年执行此项要求。

[d] 也可采用 GB/T 11140、SH/T 0253、ASTM D7039 进行测定,在有异议时,以 SH/T 0689 方法为准。

[e] 将试样注入 100 mL 玻璃量筒中观察,应当透明,没有悬浮和沉降的机械杂质和水分。在有异议时,以 GB/T 511 和 GB/T 260 方法为准。

[f] 也可采用 GB/T 28768、GB/T 30519 和 SH/T 0693 进行测定,在有异议时,以 SH/T 0713 方法为准。

[g] 也可采用 GB/T 11132、GB/T 28768 进行测定,在有异议时,以 GB/T 30519 方法为准。

[h] 也可采用 SH/T 0720 进行测定,在有异议时,以 NB/SH/T 0663 方法为准。

[i] 也可采用 SH/T 0604 进行测定,在有异议时,以 GB/T 1884、GB/T 1885 方法为准。

ICS 75.160.20
E 31

中华人民共和国国家标准

GB 17930—2016
代替 GB 17930—2013

车 用 汽 油

Gasoline for motor vehicles

2016-12-23 发布 2016-12-23 实施

中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会 发布

前　言

本标准的全部技术内容为强制性。

本标准按照 GB/T 1.1—2009 给出的规则起草。

本标准代替 GB 17930—2013《车用汽油》。

本标准与 GB 17930—2013 相比，主要技术变化如下：

——将第 1 章“范围”的第二段由“本标准适用于由液体烃类或由液体烃类及改善使用性能的添加剂组成的车用汽油”，修改为：“本标准适用于点燃式发动机使用的、由石油制取或由石油制取的加有改善性能添加剂的车用汽油”（见第 1 章，2013 版的第 1 章）；

——删除了车用汽油（Ⅲ）的技术要求和试验方法（见 2013 版表 1），增加了第Ⅵ阶段车用汽油的技术要求，并依烯烃含量的不同分为ⅥA 阶段和ⅥB 阶段（见表 3、表 4）；

——在蒸气压的要求中增加了“换季时，加油站允许有 15 天的置换期”（见表 1、表 2、表 3、表 4、表 A.1 和表 A.2，2013 版表 2、表 3 和表 A.1）；

——修改了车用汽油（Ⅴ）硫醇硫含量的技术要求（见表 2 和表 A.1，2013 版表 3 和表 A.1）；

——删除广西地区全年执行夏季蒸气压的要求，因为广西地区为车用乙醇汽油的实施区域（见表 2、表 3、表 4、表 A.1 和表 A.2，2013 版表 3 和表 A.1）；

——修改了第 9 章“标准的实施”（见第 9 章，2013 版的第 9 章）；

——增加了表 A.2（见表 A.2）。

本标准由国家能源局提出。

本标准由全国石油产品和润滑剂标准化技术委员会石油燃料和润滑剂分技术委员会（SAC/TC 280/SC 1）归口。

本标准起草单位：中国石油化工股份有限公司石油化工科学研究院、中国石油天然气股份有限公司炼油与化工分公司、中国石油天然气股份有限公司石油化工研究院、中海石油炼化有限责任公司、中国汽车研究中心。

本标准主要起草人：倪蓓、龙军、李文乐、张建荣、张彦、张国相、郭莘、郭红松、刘倩。

本标准所代替标准的历次版本发布情况为：

——GB 17930—1999、GB 17930—2006、GB 17930—2011、GB 17930—2013。

车 用 汽 油

警告:如果不遵守适当的防范措施,本标准所属产品在生产、运输、装卸、贮运和使用等过程中可能存在危险。本标准无意对与本产品有关的所有安全问题提出建议。使用者有责任采用适当的安全和防范措施,并保证符合国家有关法规规定的条件。

1 范围

本标准规定了车用汽油的术语和定义、产品分类、要求和试验方法、取样、标志、包装、运输和贮存、安全及标准的实施。

本标准适用于点燃式发动机使用的、由石油制取或由石油制取的加有改善使用性能添加剂的车用汽油。

2 规范性引用文件

下列文件对于本文件的应用是必不可少的。凡是注日期的引用文件,仅注日期的版本适用于本文件。凡是不注日期的引用文件,其最新版本(包括所有的修改单)适用于本文件。

GB 190 危险货物包装标志

GB/T 259 石油产品水溶性酸及碱测定法

GB/T 260 石油产品水分测定法

GB/T 503 汽油辛烷值的测定 马达法

GB/T 511 石油和石油产品及添加剂机械杂质测定法

GB/T 1792 汽油、煤油、喷气燃料和馏分燃料中硫醇硫的测定 电位滴定法

GB/T 1884 原油和液体石油产品密度实验室测定法(密度计法)

GB/T 1885 石油计量表

GB/T 4756 石油液体手工取样法

GB/T 5096 石油产品铜片腐蚀试验法

GB/T 5487 汽油辛烷值的测定 研究法

GB/T 6536 石油产品常压蒸馏特性测定法

GB/T 8017 石油产品蒸气压的测定 雷德法

GB/T 8018 汽油氧化安定性的测定 诱导期法

GB/T 8019 燃料胶质含量的测定 喷射蒸发法

GB/T 8020 汽油中铅含量的测定 原子吸收光谱法

GB/T 11132 液体石油产品烃类的测定 荧光指示剂吸附法

GB/T 11140 石油产品硫含量的测定 波长色散X射线荧光光谱法

GB/T 28768 车用汽油烃类组成和含氧化合物的测定 多维气相色谱法

GB 30000.7—2013 化学品分类和标签规范 第7部分:易燃液体

GB/T 30519 轻质石油馏分和产品中烃族组成和苯的测定 多维气相色谱法

SH 0164　石油产品包装、贮运及交货验收规则

NB/SH/T 0174　石油产品和烃类溶剂中硫醇和其他硫化物的检验　博士试验法

SH/T 0253　轻质石油产品中总硫含量测定法(电量法)

SH/T 0604　原油和石油产品密度测定法(U形振动管法)

NB/SH/T 0663　汽油中醇类和醚类含量的测定　气相色谱法

SH/T 0689　轻质烃及发动机燃料和其他油品的总硫含量测定法(紫外荧光法)

SH/T 0693　汽油中芳烃含量测定法(气相色谱法)

SH/T 0711　汽油中锰含量测定法(原子吸收光谱法)

SH/T 0712　汽油中铁含量测定法(原子吸收光谱法)

SH/T 0713　车用汽油和航空汽油中苯和甲苯含量测定法(气相色谱法)

SH/T 0720　汽油中含氧化合物测定法(气相色谱及氧选择性火焰离子化检测器法)

NB/SH/T 0741　汽油中烃族组成的测定　多维气相色谱法

SH/T 0794　石油产品蒸气压的测定　微量法

ASTM D7039　汽油、柴油、喷气燃料、煤油、生物柴油、生物调合柴油，以及乙醇汽油中硫含量的测定(单波长色散X射线荧光光谱法)(Standard Test Method for Sulfur in Gasoline, Diesel Fuel, Jet Fuel, Kerosine, Biodiesel, Biodiesel Blends, and Gasoline—Ethanol Blends by Monochromatic Wavelength Dispersive X-ray Fluorescence Spectrometry)

3　术语和定义

下列术语和定义适用于本文件。

3.1

抗爆指数　antiknock index

研究法辛烷值(RON)和马达法辛烷值(MON)之和的二分之一。

4　产品分类

车用汽油(Ⅳ)按研究法辛烷值分为90号、93号和97号3个牌号，车用汽油(Ⅴ)、车用汽油(ⅥA)和车用汽油(ⅥB)按研究法辛烷值分为89号、92号、95号和98号4个牌号。

5　要求和试验方法

5.1　车用汽油中所使用的添加剂应无公认的有害作用，并按推荐的适宜用量使用。车用汽油中不应含有任何可导致车辆无法正常运行的添加物和污染物。车用汽油中不得人为加入甲缩醛、苯胺类、卤素以及含磷、含硅等化合物。

5.2　车用汽油(Ⅳ)的技术要求和试验方法见表1。

5.3　89号、92号和95号车用汽油(Ⅴ)的技术要求和试验方法见表2。企业有条件生产和销售98号车用汽油(Ⅴ)时，其技术要求应符合表A.1。

5.4　89号、92号和95号车用汽油(ⅥA)和车用汽油(ⅥB)的技术要求和试验方法分别见表3和表4。企业有条件生产和销售98号车用汽油(ⅥA)/(ⅥB)时，其技术要求应符合表A.2。

表 1 车用汽油(Ⅳ)的技术要求和试验方法

项目		质量指标			试验方法
		90	93	97	
抗爆性：					
研究法辛烷值(RON)	不小于	90	93	97	GB/T 5487
抗爆指数(RON+MON)/2	不小于	85	88	报告	GB/T 503、GB/T 5487
铅含量[a]/(g/L)	不大于	0.005			GB/T 8020
馏程：					GB/T 6536
10%蒸发温度/℃	不高于	70			
50%蒸发温度/℃	不高于	120			
90%蒸发温度/℃	不高于	190			
终馏点/℃	不高于	205			
残留量(体积分数)/%	不大于	2			
蒸气压[b]/kPa：					GB/T 8017
11 月 1 日～4 月 30 日		42～85			
5 月 1 日～10 月 31 日		40～68			
胶质含量/(mg/100 mL)：					GB/T 8019
未洗胶质含量(加入清净剂前)	不大于	30			
溶剂洗胶质含量	不大于	5			
诱导期/min	不小于	480			GB/T 8018
硫含量[c]/(mg/kg)	不大于	50			SH/T 0689
硫醇(满足下列指标之一，即判断为合格)：					
博士试验		通过			NB/SH/T 0174
硫醇硫含量(质量分数)/%	不大于	0.001			GB/T 1792
铜片腐蚀 (50 ℃，3 h)/级	不大于	1			GB/T 5096
水溶性酸或碱		无			GB/T 259
机械杂质及水分		无			目测[d]
苯含量[e](体积分数)/%	不大于	1.0			SH/T 0713
芳烃含量[f](体积分数)/%	不大于	40			GB/T 11132
烯烃含量[f](体积分数)/%	不大于	28			GB/T 11132
氧含量[g](质量分数)/%	不大于	2.7			NB/SH/T 0663
甲醇含量[a](质量分数)/%	不大于	0.3			NB/SH/T 0663
锰含量[h]/(g/L)	不大于	0.008			SH/T 0711
铁含量[a]/(g/L)	不大于	0.01			SH/T 0712

[a] 车用汽油中，不得人为加入甲醇以及含铅或含铁的添加剂。

[b] 也可采用 SH/T 0794 进行测定，在有异议时，以 GB/T 8017 方法为准。换季时，加油站允许有 15 天的置换期。

[c] 也可采用 GB/T 11140、SH/T 0253、ASTM D7039 进行测定，在有异议时，以 SH/T 0689 方法为准。

[d] 将试样注入 100 mL 玻璃量筒中观察，应当透明，没有悬浮和沉降的机械杂质和水分。在有异议时，以 GB/T 511 和 GB/T 260 方法为准。

[e] 也可采用 SH/T 0693 进行测定，在有异议时，以 SH/T 0713 方法为准。

[f] 对于 97 号车用汽油，在烯烃、芳烃总含量控制不变的前提下，可允许芳烃的最大值为 42%(体积分数)。也可采用 NB/SH/T 0741 进行测定，在有异议时，以 GB/T 11132 方法为准。

[g] 也可采用 SH/T 0720 进行测定，在有异议时，以 NB/SH/T 0663 方法为准。

[h] 锰含量是指汽油中以甲基环戊二烯三羰基锰形式存在的总锰含量，不得加入其他类型的含锰添加剂。

表 2 车用汽油(Ⅴ)技术要求和试验方法

项目		质量指标			试验方法
		89	92	95	
抗爆性:					
研究法辛烷值(RON)	不小于	89	92	95	GB/T 5487
抗爆指数(RON+MON)/2	不小于	84	87	90	GB/T 503、GB/T 5487
铅含量[a]/(g/L)	不大于	0.005			GB/T 8020
馏程:					GB/T 6536
10%蒸发温度/℃	不高于	70			
50%蒸发温度/℃	不高于	120			
90%蒸发温度/℃	不高于	190			
终馏点/℃	不高于	205			
残留量(体积分数)/%	不大于	2			
蒸气压[b]/kPa:					GB/T 8017
11月1日~4月30日		45~85			
5月1日~10月31日		40~65[c]			
胶质含量/(mg/100 mL):					GB/T 8019
未洗胶质含量(加入清净剂前)	不大于	30			
溶剂洗胶质含量	不大于	5			
诱导期/min	不小于	480			GB/T 8018
硫含量[d]/(mg/kg)	不大于	10			SH/T 0689
硫醇(博士试验)		通过			NB/SH/T 0174
铜片腐蚀(50 ℃,3 h)/级	不大于	1			GB/T 5096
水溶性酸或碱		无			GB/T 259
机械杂质及水分		无			目测[e]
苯含量[f](体积分数)/%	不大于	1.0			SH/T 0713
芳烃含量[g](体积分数)/%	不大于	40			GB/T 11132
烯烃含量[g](体积分数)/%	不大于	24			GB/T 11132
氧含量[h](质量分数)/%	不大于	2.7			NB/SH/T 0663
甲醇含量[a](质量分数)/%	不大于	0.3			NB/SH/T 0663
锰含量[a]/(g/L)	不大于	0.002			SH/T 0711
铁含量[a]/(g/L)	不大于	0.01			SH/T 0712
密度[i](20 ℃)/(kg/m³)		720~775			GB/T 1884、GB/T 1885

[a] 车用汽油中,不得人为加入甲醇以及含铅、含铁和含锰的添加剂。

[b] 也可采用 SH/T 0794 进行测定,在有异议时,以 GB/T 8017 方法为准。换季时,加油站允许有 15 天的置换期。

[c] 广东、海南全年执行此项要求。

[d] 也可采用 GB/T 11140、SH/T 0253、ASTM D7039 进行测定,在有异议时,以 SH/T 0689 方法为准。

[e] 将试样注入 100 mL 玻璃量筒中观察,应当透明,没有悬浮和沉降的机械杂质和水分。在有异议时,以 GB/T 511 和 GB/T 260 方法为准。

[f] 也可采用 GB/T 28768、GB/T 30519 和 SH/T 0693 进行测定,在有异议时,以 SH/T 0713 方法为准。

[g] 对于 95 号车用汽油,在烯烃、芳烃总含量控制不变的前提下,可允许芳烃的最大值为 42%(体积分数)也可采用 GB/T 28768、GB/T 30519、NB/SH/T 0741 进行测定,在有异议时,以 GB/T 11132 方法为准。

[h] 也可采用 SH/T 0720 进行测定,在有异议时,以 NB/SH/T 0663 方法为准。

[i] 也可采用 SH/T 0604 进行测定,在有异议时,以 GB/T 1884、GB/T 1885 方法为准。

表 3　车用汽油(ⅥA)技术要求和试验方法

项目		质量指标			试验方法
		89	92	95	
抗爆性:					
研究法辛烷值(RON)	不小于	89	92	95	GB/T 5487
抗爆指数(RON+MON)/2	不小于	84	87	90	GB/T 503、GB/T 5487
铅含量[a]/(g/L)	不大于	0.005			GB/T 8020
馏程:					GB/T 6536
10%蒸发温度/℃	不高于	70			
50%蒸发温度/℃	不高于	110			
90%蒸发温度/℃	不高于	190			
终馏点/℃	不高于	205			
残留量(体积分数)/%	不大于	2			
蒸气压[b]/kPa:					GB/T 8017
11 月 1 日～4 月 30 日		45～85			
5 月 1 日～10 月 31 日		40～65[c]			
胶质含量/(mg/100 mL):					GB/T 8019
未洗胶质含量(加入清净剂前)	不大于	30			
溶剂洗胶质含量	不大于	5			
诱导期/min	不小于	480			GB/T 8018
硫含量[d]/(mg/kg)	不大于	10			SH/T 0689
硫醇(博士试验)		通过			NB/SH/T 0174
铜片腐蚀 (50 ℃,3 h)/级	不大于	1			GB/T 5096
水溶性酸或碱		无			GB/T 259
机械杂质及水分		无			目测[e]
苯含量[f](体积分数)/%	不大于	0.8			SH/T 0713
芳烃含量[g](体积分数)/%	不大于	35			GB/T 30519
烯烃含量[g](体积分数)/%	不大于	18			GB/T 30519
氧含量[h](质量分数)/%	不大于	2.7			NB/SH/T 0663
甲醇含量[a](质量分数)/%	不大于	0.3			NB/SH/T 0663
锰含量[a]/(g/L)	不大于	0.002			SH/T 0711
铁含量[a]/(g/L)	不大于	0.01			SH/T 0712
密度[i](20 ℃)/(kg/m³)		720～775			GB/T 1884、GB/T 1885

[a] 车用汽油中,不得人为加入甲醇以及含铅、含铁和含锰的添加剂。

[b] 也可采用 SH/T 0794 进行测定,在有异议时,以 GB/T 8017 方法为准。换季时,加油站允许有 15 天的置换期。

[c] 广东、海南全年执行此项要求。

[d] 也可采用 GB/T 11140、SH/T 0253、ASTM D7039 进行测定,在有异议时,以 SH/T 0689 方法为准。

[e] 将试样注入 100 mL 玻璃量筒中观察,应当透明,没有悬浮和沉降的机械杂质和水分。在有异议时,以 GB/T 511 和 GB/T 260 方法为准。

[f] 也可采用 GB/T 28768、GB/T 30519 和 SH/T 0693 进行测定,在有异议时,以 SH/T 0713 方法为准。

[g] 也可采用 GB/T 11132、GB/T 28768 进行测定,在有异议时,以 GB/T 30519 方法为准。

[h] 也可采用 SH/T 0720 进行测定,在有异议时,以 NB/SH/T 0663 方法为准。

[i] 也可采用 SH/T 0604 进行测定,在有异议时,以 GB/T 1884、GB/T 1885 方法为准。

表 4　车用汽油(ⅥB)技术要求和试验方法

项目		质量指标			试验方法
		89	92	95	
抗爆性：					
研究法辛烷值(RON)	不小于	89	92	95	GB/T 5487
抗爆指数(RON+MON)/2	不小于	84	87	90	GB/T 503、GB/T 5487
铅含量[a]/(g/L)	不大于	0.005			GB/T 8020
馏程：					GB/T 6536
10%蒸发温度/℃	不高于	70			
50%蒸发温度/℃	不高于	110			
90%蒸发温度/℃	不高于	190			
终馏点/℃	不高于	205			
残留量(体积分数)/%	不大于	2			
蒸气压[b]/kPa：					GB/T 8017
11 月 1 日～4 月 30 日		45～85			
5 月 1 日～10 月 31 日		40～65[c]			
胶质含量/(mg/100 mL)：					GB/T 8019
未洗胶质含量(加入清净剂前)	不大于	30			
溶剂洗胶质含量	不大于	5			
诱导期/min	不小于	480			GB/T 8018
硫含量[d]/(mg/kg)	不大于	10			SH/T 0689
硫醇(博士试验)		通过			NB/SH/T 0174
铜片腐蚀 (50 ℃,3 h)/级	不大于	1			GB/T 5096
水溶性酸或碱		无			GB/T 259
机械杂质及水分		无			目测[e]
苯含量[f](体积分数)/%	不大于	0.8			SH/T 0713
芳烃含量[g](体积分数)/%	不大于	35			GB/T 30519
烯烃含量[g](体积分数)/%	不大于	15			GB/T 30519
氧含量[h](质量分数)/%	不大于	2.7			NB/SH/T 0663
甲醇含量[a](质量分数)/%	不大于	0.3			NB/SH/T 0663
锰含量[a]/(g/L)	不大于	0.002			SH/T 0711
铁含量[a]/(g/L)	不大于	0.01			SH/T 0712
密度[i](20 ℃)/(kg/m^3)		720～775			GB/T 1884、GB/T 1885

[a] 车用汽油中，不得人为加入甲醇以及含铅、含铁和含锰的添加剂。

[b] 也可采用 SH/T 0794 进行测定，在有异议时，以 GB/T 8017 方法为准。换季时，加油站允许有 15 天的置换期。

[c] 广东、海南全年执行此项要求。

[d] 也可采用 GB/T 11140、SH/T 0253、ASTM D7039 进行测定，在有异议时，以 SH/T 0689 方法为准。

[e] 将试样注入 100 mL 玻璃量筒中观察，应当透明，没有悬浮和沉降的机械杂质和水分。在有异议时，以 GB/T 511 和 GB/T 260 方法为准。

[f] 也可采用 GB/T 28768、GB/T 30519、SH/T 0693 进行测定，在有异议时，以 SH/T 0713 方法为准。

[g] 也可采用 GB/T 11132、GB/T 28768 进行测定，在有异议时，以 GB/T 30519 方法为准。

[h] 也可采用 SH/T 0720 进行测定，在有异议时，以 NB/SH/T 0663 方法为准。

[i] 也可采用 SH/T 0604 进行测定，在有异议时，以 GB/T 1884、GB/T 1885 方法为准。

6 取样

取样按 GB/T 4756 进行，取 4 L 作为检验和留样用。若车用汽油中含锰，取样时应避光。

7 标志、包装、运输和贮存

7.1 向用户销售的符合本标准要求的车用汽油所使用的加油机都应明确标示产品的名称、牌号和等级（Ⅳ、Ⅴ、ⅥA 和ⅥB）。如："89 号汽油（Ⅴ）""92 号汽油（Ⅴ）""95 号汽油（Ⅴ）"等，并应标识在消费者可以看见的地方。

7.2 车用汽油属易燃液体，产品的标志、包装、运输和贮存及交货验收按 SH 0164、GB 30000.7—2013 和 GB 190 进行。

8 安全

车用汽油属易燃液体，其危险说明和防范说明见 GB 30000.7—2013 中附录 D。

9 标准的实施

本标准自发布之日起在全国范围内实施，并实行逐步引入的过渡期要求。表 2 和表 A.1 规定的技术要求过渡期至 2016 年 12 月 31 日，自 2017 年 1 月 1 日起，表 1 规定的技术要求废止；表 3 和表 A.2 规定的技术要求过渡期至 2018 年 12 月 31 日，自 2019 年 1 月 1 日起，表 2 和表 A.1 规定的技术要求废止；表 4 规定的技术要求过渡期至 2022 年 12 月 31 日，自 2023 年 1 月 1 日起，表 3 规定的技术要求废止。

考虑到国内某些地区环保的特殊需求，各地方政府可依据其环保治理要求，与相关油品供应部门协商一致后，可提前实施相应阶段的车用汽油技术要求。

附　录　A
（规范性附录）
98 号车用汽油的技术要求和试验方法

98 号车用汽油（Ⅴ）的技术要求和试验方法见表 A.1。98 号车用汽油（ⅥA）/（ⅥB）的技术要求和试验方法见表 A.2。

表 A.1　98 号车用汽油（Ⅴ）技术要求和试验方法

项目		质量指标	试验方法
抗爆性：			
研究法辛烷值(RON)	不小于	98	GB/T 5487
抗爆指数(RON+MON)/2	不小于	93	GB/T 503、GB/T 5487
铅含量[a]/(g/L)	不大于	0.005	GB/T 8020
馏程：			GB/T 6536
10%蒸发温度/℃	不高于	70	
50%蒸发温度/℃	不高于	120	
90%蒸发温度/℃	不高于	190	
终馏点/℃	不高于	205	
残留量(体积分数)/%	不大于	2	
蒸气压[b]/kPa：			GB/T 8017
11 月 1 日～4 月 30 日		45～85	
5 月 1 日～10 月 31 日		40～65[c]	
胶质含量/(mg/100 mL)：			GB/T 8019
未洗胶质含量(加入清净剂前)	不大于	30	
溶剂洗胶质含量	不大于	5	
诱导期/min	不小于	480	GB/T 8018
硫含量[d]/(mg/kg)	不大于	10	SH/T 0689
硫醇(博士试验)		通过	NB/SH/T 0174
铜片腐蚀 (50 ℃,3 h)/级	不大于	1	GB/T 5096
水溶性酸或碱		无	GB/T 259
机械杂质及水分		无	目测[e]
苯含量[f](体积分数)/%	不大于	1.0	SH/T 0713
芳烃含量[g](体积分数)/%	不大于	40	GB/T 11132
烯烃含量[g](体积分数)/%	不大于	24	GB/T 11132
氧含量[h](质量分数)/%	不大于	2.7	NB/SH/T 0663
甲醇含量[a](质量分数)/%	不大于	0.3	NB/SH/T 0663

表 A.1（续）

项目		质量指标	试验方法
锰含量[a]/(g/L)	不大于	0.002	SH/T 0711
铁含量[a]/(g/L)	不大于	0.01	SH/T 0712
密度[i](20 ℃)/(kg/m^3)		720～775	GB/T 1884、GB/T 1885

[a] 车用汽油中，不得人为加入甲醇以及含铅、含铁和含锰的添加剂。
[b] 也可采用SH/T 0794进行测定，在有异议时，以GB/T 8017方法为准。换季时，加油站允许有15天的过渡期。
[c] 广东、海南全年执行此项要求。
[d] 也可采用GB/T 11140、SH/T 0253、ASTM D7039进行测定，在有异议时，以SH/T 0689方法为准。
[e] 将试样注入100 mL玻璃量筒中观察，应当透明，没有悬浮和沉降的机械杂质和水分。在有异议时，以GB/T 511和GB/T 260方法为准。
[f] 也可采用GB/T 28768、GB/T 30519、SH/T 0693进行测定，在有异议时，以SH/T 0713方法为准。
[g] 对于98号车用汽油，在烯烃、芳烃总含量控制不变的前提下，可允许芳烃的最大值为42%（体积分数）。也可采用GB/T 28768、GB/T 30519和NB/SH/T 0741进行测定，在有异议时，以GB/T 11132方法为准。
[h] 也可采用SH/T 0720进行测定，在有异议时，以NB/SH/T 0663方法为准。
[i] 也可采用SH/T 0604进行测定，在有异议时，以GB/T 1884、GB/T 1885方法为准。

表 A.2　98号车用汽油（ⅥA）/（ⅥB）技术要求和试验方法

项目		质量指标	试验方法
抗爆性：			
研究法辛烷值(RON)	不小于	98	GB/T 5487
抗爆指数(RON+MON)/2	不小于	93	GB/T 503、GB/T 5487
铅含量[a]/(g/L)	不大于	0.005	GB/T 8020
馏程：			GB/T 6536
10%蒸发温度/℃	不高于	70	
50%蒸发温度/℃	不高于	110	
90%蒸发温度/℃	不高于	190	
终馏点/℃	不高于	205	
残留量(体积分数)/%	不大于	2	
蒸气压[b]/kPa：			GB/T 8017
11月1日～4月30日		45～85	
5月1日～10月31日		40～65[c]	
胶质含量/(mg/100 mL)：			GB/T 8019
未洗胶质含量(加入清净剂前)	不大于	30	
溶剂洗胶质含量	不大于	5	
诱导期/min	不小于	480	GB/T 8018
硫含量[d]/(mg/kg)	不大于	10	SH/T 0689
硫醇(博士试验)		通过	NB/SH/T 0174

表 A.2（续）

项目		质量指标	试验方法
铜片腐蚀（50 ℃，3 h）/级	不大于	1	GB/T 5096
水溶性酸或碱		无	GB/T 259
机械杂质及水分		无	目测[e]
苯含量[f]（体积分数）/%	不大于	0.8	SH/T 0713
芳烃含量[g]（体积分数）/%	不大于	35	GB/T 30519
烯烃含量[g]（体积分数）/%	不大于	15	GB/T 30519
氧含量[h]（质量分数）/%	不大于	2.7	NB/SH/T 0663
甲醇含量[a]（质量分数）/%	不大于	0.3	NB/SH/T 0663
锰含量[a]/(g/L)	不大于	0.002	SH/T 0711
铁含量[a]/(g/L)	不大于	0.01	SH/T 0712
密度[i]（20 ℃）/(kg/m^3)		720～775	GB/T 1884、GB/T 1885

[a] 车用汽油中，不得人为加入甲醇以及含铅、含铁和含锰的添加剂。

[b] 也可采用 SH/T 0794 进行测定，在有异议时，以 GB/T 8017 方法为准。换季时，加油站允许有 15 天的过渡期。

[c] 广东、海南全年执行此项要求。

[d] 也可采用 GB/T 11140、SH/T 0253、ASTM D7039 进行测定，在有异议时，以 SH/T 0689 方法为准。

[e] 将试样注入 100 mL 玻璃量筒中观察，应当透明，没有悬浮和沉降的机械杂质和水分。在有异议时，以 GB/T 511 和 GB/T 260 方法为准。

[f] 也可采用 GB/T 28768、GB/T 30519 和 SH/T 0693 进行测定，在有异议时，以 SH/T 0713 方法为准。

[g] 也可采用 GB/T 11132、GB/T 28768 进行测定，在有异议时，以 GB/T 30519 方法为准。

[h] 也可采用 SH/T 0720 进行测定，在有异议时，以 NB/SH/T 0663 方法为准。

[i] 也可采用 SH/T 0604 进行测定，在有异议时，以 GB/T 1884、GB/T 1885 方法为准。