



Taiwan Profile and Fuel Quality Standards Update

Taiwan's rapid industrialization and economic growth during the latter part of the 20th century has transformed it into an advanced economy as one of the "Four Asian Tigers," alongside Singapore, South Korea, and Hong Kong. Consequently, Taiwan is categorized as a high-income area by the World Bank, and an advanced economy by the International Monetary Fund, and is recognized for its technology development and industry, especially in consumer electronics.

Taiwan is a densely populated island with limited natural resources, and relies on crude oil imports for most of its energy requirements, especially for transport (coal does provide about 55% of its electrical power generation). The Bureau of Energy, organized in 2004 from the previous Energy Commission under the Ministry of Economic Affairs, implements area-wide energy policies, such as the Petroleum Administration Act. The act is designed to promote sound development of the oil industry, safeguard production and sales of oil and refined products, ensure supply and environmental protection, and enhances people's livelihoods as the economy develops.

The largest oil company, Chinese Petroleum Corporation (CPC), is the dominant player in all sectors of the petroleum industry. CPC operates three domestic refineries with combined processing capacity of 720,000 barrels per day (b/d). Formosa Petrochemical Corporation also operates a 450,000 b/d refinery. Taiwan's refining capacity currently exceeds domestic demand, resulting in the island being a net petroleum products exporter.

Fuel quality is regulated under two standards in Taiwan. The first standard is the China National Standard (CNS), which is a technical standard developed by the Bureau of Standards, Metrology and Inspection under the Ministry of Economic Affairs. The second standard is issued by the Taiwan Environmental Protection Administration (EPA), which regulates fuel quality related to environmental and emissions performance.

Taiwan is somewhat unique in the region in that initially it adopted the California state (U.S.) Complex Emissions Model to establish the performance standards. Input parameters for

INSIDE THIS ISSUE

Taiwan Profile & Fuel Quality Standards Update

EU - Update on Fuel Quality Directive Implementation

Middle East PetroTech 2010 Held in Bahrain

ASTM International 2010 Summer Meeting Update

Fuel Industry Updates

this model includes gasoline properties for benzene, aromatics, olefins, sulphur, oxygen, vapour pressure (RVP), and distillation points. Starting January 2007, gasoline specifications switched from performance-based to quality-based parameters, thus the California model was no longer used.

The gasoline quality-based specifications adopted reduced sulphur content to 50 ppm max, and limited aromatics levels to 36 vol. % max, and olefins at 18 vol.% max. The oxygen limit increased to 2.7 wt. %, and the RVP limit reduced to 60 kPa. Table 1 summaries current select gasoline standards required under CNS and the Taiwan EPA.

Starting July 2011, the EPA will require gasoline aromatics levels be reduced to 35 vol. % max. Then starting (Continued on p4)

Table 1 – Current Select Gasoline Standards for Taiwan

Specification Name	Standard	Test Method
RON, min (three grades)	92/95/98	CNS 12011
Sulphur, ppm, max	50	CNS 13877 CNS 14505
Lead, g/l, max	0.0013	CNS 12762
Benzene, vol.%, max	1	CNS 14298
Aromatics, vol.%, max	36	CNS 14298
Olefins, vol.%, max	18	CNS 3577
RVP @ 37.8°C, kPa, max	60	CNS 12012 CNS 14666
Oxygen, wt.%, max	2.7	CNS 14297
Oxygenates, Ethanol vol.%, max	3	
Distillation		
T ₁₀ , °C, max	70	CNS 1218
T ₅₀ , °C, max	121	CNS 1218
T ₉₀ , °C, max	190	CNS 1218
FBP, °C, max	225	CNS 1218

Source: International Fuel Quality Center, Taiwan Ministry of Economic Affairs

CLEAN AIR THROUGH CLEAN FUELS



FEATURE

EU - Update on Fuel Quality Directive Implementation

In April 2009, the European Union adopted the Fuel Quality Directive (FQD), formally titled “*Directive 2009/30/EC of the European Parliament and of the Council amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC.*”

This directive significantly changed the quality requirements for gasoline and diesel, allowing an increase in blending specifications for bioethanol in gasoline and biodiesel in diesel fuel. The directive also introduced an obligation to reduce greenhouse gas (GHG) emissions from transportation fuels by at least 6% by 2020. The FQD is an element of a wider policy concept that was incorporated into the Climate Change and Energy Package with the aim of reducing GHG emissions by 20%, reaching 20% renewable energy in the overall energy mix and increasing energy efficiency by 20% by 2020.

According to the FQD, each Member State must transpose the provisions of this directive by the end of 2010. To date, only a few have officially informed the Commission of the legislation through which they intend to implement the FQD. Usually Member States separate technical provisions of the directive (e.g., specifications for gasoline and diesel) from the provisions concerning GHG emissions reduction. Quality requirements for gasoline and diesel are usually implemented via technical regulations (identified as decrees or ordinances). To date, the following countries have proposed the national legislation to begin transposing the FQD: Czech Republic; Estonia; Germany, and Poland (government plan to adopt provisions).

GHG EMISSIONS REDUCTION FROM TRANSPORTATION FUELS

According to Article 7a (2) of the FQD, fuel suppliers are obligated to reduce lifecycle GHG emissions from transportation fuels by at least 6% by 2020, compared to the 2010 baseline. It is expected that the target will be achieved through the use of sustainable biofuels and other low-carbon fuel mechanisms.

The methodology used to calculate GHG emissions from low-carbon fuels is already incorporated into the FQD and is the same as the calculation used under the framework of the 10% renewable energy in transportation by 2020 target. As far as other fuels are concerned, the methodology used to calculate their GHG emissions will be established by the Commission and accepted by a committee consisting of experts from each Member State. The Commission has already drafted a directive specifying this meth-

odology and a communication explaining different aspects of the implementation of Article 7a. The calculating methodology in the decision will likely be based on the following rules:

- Life-cycle GHG emissions are divided into five stages: extraction (approximately 5% of life-cycle GHG emissions), transportation of raw material (1%), refining (below 10%), distribution of finished products (1%) and consumption (85%); and
- It is relatively easy to determine the emissions contribution of some stages (transportation and consumption), so the Commission wants to propose some default values (depending on mode of transportation, for example).



The most problematic stages are extraction and refining. The most appropriate approach for extraction would be to trace the oil to the individual production well (chain of custody) and to then determine the GHG emissions output, which is done by establishing what techniques were used, such as extended oil recovery, flaring and venting. This would require cooperation from all companies that produce oil for export to Europe. Where these data are not available,

the recourse to default values would be acceptable.

In terms of refining, given the complexity of the processes and multiple products being produced in parallel, the Commission wants to offer suppliers the opportunity to calculate GHG emissions used on their performance. The decision is expected to be adopted by year-end 2010.

NEXT STEPS

All Member States are required to implement the FQD by year-end 2010. Date notifications have shown that the governments usually implement fuel quality-related provisions of the FQD separately from the provisions on GHG emissions reduction. In fact, Germany is the only country that introduced a GHG emissions reduction target for transportation fuels in its legislation. Other countries are waiting for the Commission to release its decision and communication on the implementation of Article 7a.

Some countries that incorporate European standards on the quality of gasoline and diesel in binding legislation are waiting for the European Committee for Standardization (CEN) to develop its final standard on E10 blends. Considering the procedural steps that must remain, it is highly likely that the majority of Member States will delay implementation of the FQD, and that national measures needed to achieve the targets established in the FQD will not be adopted before the first half of 2011.



Middle East PetroTech 2010 Held in Bahrain

The 7th Middle East International Refining and Petrochemicals Conference and Exhibition (PetroTech 2010) was recently held in Bahrain. The theme of this year's programme was "Downstream Challenges: Financing, Market Changes and Technology." Over 3,000 downstream oil and gas professionals, from 125 companies, converged to the island country to learn about technology innovation, market opportunities, operational efficiency and reliability, safety improvements, and product quality issues. The conference included over 70 presentations made during 15 break-out session, and a dozen quest speakers addressed plenary sessions. Some highlights of this premier annual programme are as follows.

H.E. Dr. Abdulhussain bin Ali Mirza, Bahrain's Minister of Oil and Gas Affairs, gave a special address to open the conference. The minister noted that, while crude prices remained volatile and refinery margins remained tight, future movements and demand for crude oil in long term are impacted by various external factors. Some of these key factors include:

- Continuing high demand from China and India,
- Expanding deployment of nuclear energy,
- Mass transportation strategies adopted by developing nations,
- Increasing role of liquefied natural gas (LNG),
- Adoption of bio-fuels mandates,
- Acceptance of energy-efficient and hybrid vehicles;
- Transport fuel quality improvements; and
- Supply scenarios from Nigeria, Venezuela, Iraq, and Angola.

The minister also spoke about Bahrain's Refinery Master Plan Project that includes reducing the impact of energy sources on climate change by improving the environmental sustainability of oil and gas as viable long-term sources of clean energy supply. Carbon capture and storage (CCS) is one of the key technologies to achieve this sustainability. Other initiatives include optimising crude availability with a new pipeline project, building a new state-of-the art high-value lubricants plant, and improving reliability of existing refining infrastructure to remain cost-competitive. Throughout each of these strategies, the ministry reinforces the need to minimize the environmental impacts of operations.

As recovery from the global economic recession occurs, future world economic growth is projected to be in the range of 3.0 to 4.0 percent per annum. Alternative energy sources will impact the demand for refined products, but demand will continue to be serviced by gasoline and middle distillates from refined crude oil.

Mr Steve Pryor, president of ExxonMobil Chemical Company, gave a keynote speech on "Challenges in Petrochemicals: the Business Cycle and Beyond." He commended the conference organisers and companies represented for supporting the emphasis on safety and operational excellence, and best practices. These are funda-

mental to sustained success in the oil and gas industries.

He noted that the mature economies of the OECD will grow by over 50% by 2030, while non-OECD countries will grow at more than three times that pace. The energy, fuels and petrochemicals industries will enable the wealth creation and improved living standards that will come with this economic expansion. He also talked about the critical long-term challenges to the business cycle for this growth – feedstock supply, energy efficiency and free trade.

Dr Hassan Hassoun, Downstream Ventures Directorate, Qatar Petroleum Company, spoke about "Gasoline Quality & Production: Processes versus Standard Requirements." He examined some of the properties, production technologies, blending components and environmental requirements impacting gasoline quality. Sulphur reduction processes can decrease octane (RON), along with aromatics and olefins removal. Concerns about carbon emissions will push for higher hydrogen-carbon ratios in fuels. When considering properties of gasoline blending components, he observed that only oxygenates and alkyates have no quality weaknesses. He further noted that MTBE has higher energy value that is closer to that of gasoline, and does not create a "food versus fuel" challenge inherent to most biofuel use.

Mr Mohamed H. Al-Mady, vice chairman and chief executive officer, Saudi Basic Industries Corporation (SABIC), presented a keynote address titled "Alternative Energy/Fossil Fuel: A Planned Co-existence." The U.S. Energy Information Agency (EIA) projects that world energy demand will increase by 1.5% per year, with 90% of the increase from non-OECD countries. Primary resources of coal, oil and gas are being depleted thus requiring development of alternative energy resources, including nuclear, hydro, and other renewables. He noted that transportation is the fastest growing energy demand sector and currently 98% of global transport runs on oil-based fuels. Non-conventional vehicles, like battery-electric, hybrid, and plug-in power, are growing in use and could represent up to have of new vehicles by 2030 (according to EIA). The one challenge to this expansion is reducing costs to encourage consumer purchase and use. He noted that renewable energy continues to have highest energy subsidies. Mr Al-Mady went on to show examples of alternative energy development in the Middle East.

PetroTech 2010 provided extensive opportunities for the oil and gas industry to share ideas, learn about latest developments, and take home technical and strategic information to ensure continued energy supplies for consumers around the world.





ASTM International 2010 Summer Meeting Update

The ASTM International (formerly American Society of Testing and Materials) held its summer meeting in Kansas City, Missouri (US) in June. The ASTM D02 Committee handles specifications and testing methods on petroleum products and lubricants. The D02 Committee has membership of about 2,200 industry professionals and technical experts, and has jurisdiction over 725 standards that are published in five volumes of the Annual Book of ASTM Standards (Volumes 05.01 thru 05.05). These standards have, and continue to play a preeminent role in all aspects relating to the standardization of petroleum products and lubricants. Many countries and their government agencies use ASTM specifications, methods and guidelines as references for their regulatory standards. The use of ASTM specifications for references helps the fuels industry ensure and maintain quality, and increases fungibility of products across markets.

There are over 150 subcommittees and working groups within the D02 Committee. During the 2010 ASTM summer program, numerous D02 Committee and subcommittee meetings were held. The following summarizes key discussions and outcomes for gasoline and diesel fuels.

The D02 Committee is examining several test methods and considering significant updates for the Reformulated Gasoline (RFG) report in the U.S. as it pertains to the expansion of the Renewable Fuels Standards (RFS) program. The increasing mandate for renewables and potential allowance by EPA for higher blending of bio-ethanol into gasoline means certification requirements for detergent additives needs to be reviewed.

The ASTM committee also has an ongoing effort for developing test method changes for higher octane fuels that could enter the market if EPA approves the higher biofuel blends. The committee postponed any final recommendations until after the EPA issues some decision. Also, the American Petroleum Institute (API) is conducting a study to understand bioethanol blending behavior above the currently al-

lowed 10 vol.%. Volatility is the main property of concern and various specific blending volumes are being evaluated for impacts to emissions and vehicle components. The API work thus far indicates that vapour pressure drops below the 10 vol.% blend level, and as volume increases the change to vapour pressure tends to moderate.

In the gasoline specification, a cautionary statement on silicone contamination is being included until the test method for silicone under development through the committee is approved.

A specification is being developed for ethyl tertiary butyl ether (ETBE) blending with aviation spark-ignition engine fuel. The D02 Committee work item (WK16902) is established for monitoring progress on this specification change.

A new Task Force has been formed to investigate the inclusion of an ultra-low lead grade of aviation gasoline. A number of countries that have banned the use of lead-additives in gasoline have continued to allow an exemption for some use in general aviation gasoline. The concern about continued use of leaded aviation gasoline results from ambient air quality monitoring that indicates failure to meet standards for lead levels. The D02 Task Force is evaluating a new minimum lead specification in the current grade in the aviation gasoline specification. Changes to the specification could help non-attainment areas to modify compliance programs to further lower ambient lead levels and mitigation human exposures to harmful lead particles.

The D02 Committee also worked on changes to test methods and specifications for biodiesel fuels, jet fuels and E85 fuels (blend of 85 vol.% bioethanol and 15 vol.% gasoline). Staff with the International Fuel Quality Center, from Houston, Texas (US), attended the ASTM International D02 Committee meetings. Further details on the meeting outcomes can be obtained by contacting IFQC at +1-713-260-6474, or www.ifqc.org

Taiwan Profile and Fuel Quality Standards Update

(continued from p1) January 2012, the gasoline fuel sulphur limits will be reduced to 10 ppm max. The sulphur level in vehicle diesel fuel will also be reduced to 10 ppm max. starting July 2011. Starting this coming December 2010, the Taiwan Ministry of Economic Affairs will increase the required biodiesel blend level to B2 (i.e., biodiesel at 2 vol. % in diesel fuels).

With its high population density and many industrial facilities, certain areas in Taiwan are impacted by poor air quality. Emissions from motor vehicles, especially from motor scooters using two-stroke engines, are the main source of air emission in urban centers. Recent registration data indicate that motorcycles account for 68% of vehicles on the roads, followed by 27% for passenger vehicles.

The Air Pollution Control Act empowers the government at different levels to establish air quality standards and to monitor for

compliance. Air quality levels from 2000 to 2008 indicated stable or slowly improving air quality. To further help improve overall air quality, the Taiwan EPA set the objective of reducing the percentage of days having Pollutant Standard Index over 100, which indicate poor air quality. The air quality improvement targets are to reach fewer than 2% of days with PSI-100 (or greater) by 2011, and fewer than 1.5% of days by 2016. Other pollution control strategies for reducing emissions from vehicles, stationary sources (industry), and construction were also implemented.

The economic progress of Taiwan has been dramatic over the past several decades, and continued growth is anticipated. Challenges for environmental protection have accompanied this advancement. However, this progress has allowed adoption of strong fuel quality standards and other controls to help combat air quality impacts.



Fuels Industry Updates

U.S. EPA SUSPENDS ASSESSMENTS DUE TO QUESTIONABLE ITALIAN TEST DATA

The U.S. Environmental Protection Agency recently announced that it was suspending ongoing assessments of four chemicals pending additional review of research conducted by the Ramazzini Institute, located in Italy. The chemicals include methanol, MTBE, ETBE, and acrylonitrile. A team of pathologists from the U.S. National Toxicology Program (NTP) had visited the institute to examine results of toxicology studies carried out on the chemicals. The NTP report from its partial review and audit of the results concluded that further reviews are necessary to support or refute the overall conclusions of the studies. For the past several years, efforts to review the data at the institute had been attempted based on concerns expressed by several authoritative bodies and outside expert pathologists about methodologies and the animal colony maintain and used for research at the facility. The EPA stated that it took the action "out of an abundance of caution and to ensure the agency's chemical assessments are grounded in the soundest possible science." The EPA indicates that the NTP review found differences with the institute researchers on diagnoses of certain pathology findings. As a result of these differences, EPA acknowledged the need to conduct a more thorough review of the Ramazzini studies before proceeding with assessments on the chemicals. The EPA has not indicated when (or if) the institute will grant further access to its data for the necessary reviews.

NEW EMISSIONS & FUEL QUALITY STANDARDS IN AZERBAIJAN

On 1 July 2010, Azerbaijan reportedly began enforcing Euro-2 equivalent standards for vehicles and corresponding fuel quality requirements. Discussions for introducing cleaner fuels and more stringent emissions requirements were started several years ago. The government announced the July 1st enforcement date in mid-February 2010. This action essentially bans the import of vehicles not conforming to Euro-2 emissions standards, and bans production and import of fuels that do not meet the quality standards. The decision does not affect vehicles already operating in Azerbaijan.

About 80% of vehicles in the capital city, Baku, are of Euro-2 emissions standard level or older, however, outside of the capital this share is believed to be near 100%. Since the restriction applies only to vehicles being imported after the enforcement date, it will take some time for fleet turnover to occur.

Regarding the improvements in fuel quality requirements, no delays in providing the fuels are expected. Azerbaijan's domestic refiners have the ability to supply fuels meeting the Euro-2 quality specifications. Further modernization of the facilities

is in progress. The State Oil Company of Azerbaijan plans to produce Euro-3 equivalent fuels by late 2011 or early 2012. The government has not announced whether new technical standards are being issued to correspond to the higher quality fuel properties.

HEALTH CANADA ESTIMATES HUMAN HEALTH RISK FOR INHALED MANGANESE



Health
Canada

Santé
Canada

Health Canada recently published a human health risk

assessment for manganese that found higher distribution and accumulation in the body's tissues when inhaled compared to lower levels when ingested. The Health Canada assessment found that only a small percentage of an ingested (oral) dose of manganese enters the body's systemic circulation. In contrast, inhaled manganese deposited on the nasal passage tissues can be transported directly along the olfactory system to the nerve center within the brain. This provides a direct conduit between the nervous system and the outside environment.

Manganese (CAS 7439-96-5), a biologically essential mineral in trace amounts, is a well documented toxicant in humans at sufficiently elevated exposure levels. Although manganese can be toxic to a number of organ systems including the reproductive and respiratory systems, the critical target organ is the central nervous system. Moderate levels of exposure can result in worsening of subclinical neurological function including fine motor control, tremor, memory and cognitive ability, consistent with damage to the basal ganglia of the brain.

Based on the assessment, Health Canada determined a new reference concentration for inhaled manganese at 0.05 µg/m³ in PM_{2.5}. This value reflects the concentration to which the general population, including sensitive subgroups, can be exposed without significant effects. The Health Canada assessment report can be found at: <http://www.hc-sc.gc.ca/ewh-semt/pubs/air/manganese-eng.php>

INDONESIAN AIR QUALITY DECLINES

According to the Meteorology, Climatology and Geophysics Agency (BMKG), air quality in most of Indonesia's cities declined over the last year. The BMKG monitors dust, PM₁₀, NO₂, SO₂, and ozone levels to determine compliance to government ambient air standards. The agency reported that PM₁₀ concentrations in four cities – Bandung, Palembang, Tangerang and Jakarta – reached unhealthful levels set by the government. Other air quality parameters were also exceeded at various times during the year. The Indonesia Environment Ministry believes that the

(Continued on p6)



Fuels Industry Updates

substantial growth in motorcycles on urban roads has greatly impacted air pollution levels.

The Environment Ministry announced that air quality criteria will become part of its Adipura Awards given to cities achieving environmental improvements. The addition of air quality measures seeks to encourage cities to reduce air pollution and greenhouse gas emissions that principally come from transport sector. The ministry notes that sustainable transportation system is the key to reducing air pollution. The government is currently working on a national strategy and action plan on urban air quality improvement as a guideline for local jurisdictions to develop effective air pollution control policies.

U.S. EPA DELAYS DECISION TO INCREASE ETHANOL-GASOLINE BLEND

The U.S. Environmental Protection Agency (EPA) delayed a decision on whether to allow an increase in the ethanol blending level in gasoline from the current limit of 10 vol.% (E10) up to 15 vol.% (E15). In March 2009, an ethanol industry group, Growth Energy, petitioned the EPA seeking a waiver approval for the higher blend level. The U.S. Clean Air Act (CAA) provisions require that EPA assess technical, performance, emissions and compatibility information before granting a waiver from fuel standards to increase ethanol blending. The EPA had been expected to release a decision in July 2010 (which was already a deferral from December 2009), however car manufacturers are expressing concerns that the higher ethanol content could damage engines, particularly in older models. The U.S.-based Alliance of Automobile Manufacturers believes the E15 blend can weaken older engine performance. Other small engine makers and marine boating interests are also concerned about impacts. Furthermore, refueling stations would need to modify or add new pumps, and notifications and controls would need to be put into place to prevent misfueling if a conditional waiver were given that applies only to newer vehicles.

Ongoing research is taking place to investigate the impacts of the increased ethanol blends on vehicle models back to 2001. Vehicle engine and components testing are being done by federal government labs and by joint auto-oil research groups. Preliminary results reported to EPA earlier in the year were mixed, prompting the auto-oil research group to recommend that EPA wait until further results become available later this year. EPA notified Growth Energy that with the research still underway a final decision on the waiver would not be made until later in the year.

IEA PEGS CHINA AS LARGEST ENERGY USER – SURPASSING U.S.



Data for 2009 released by the Paris-based International Energy Agency (IEA) pegs China as the largest energy user in the world, surpassing the U.S. The IEA information for 2009 listed China's energy consumption of 2,252 million tons of oil equivalent (toe), compared to the 2,170 million toe consumption by the U.S.

The IEA reports a standardized sum of all energy consumption across the various resources used, including petroleum, natural gas, coal, nuclear and renewables. Energy demand in China has doubled over the prior 10 years, according to the IEA, driven by economic growth. Conversely, in 2009, the global recession drove down U.S. energy demand, likely contributing to China's leap in status. China expressed doubt about the IEA's data for the country. According to Xinhua News Agency, reporting on China's National Bureau of Statistics, the country's energy consumption last year was 2,132 million toe, lower than the IEA figure. Regardless of the overall 2009 consumption, the amount of energy used by the average Chinese citizen is about one-fifth that used by the average U.S. consumer.

Upcoming Industry Events

World Energy Congress
12 – 16 September,
Montreal, Canada

Petrotech 2010
31 October – 3 November,
New Delhi

Downstream Asia 2010
27-29 October, Singapore

Better Air Quality Conference
9 – 11 November, Singapore



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