21ST MEETING

HELD AT

INDIAN INSTITUTE OF PETROLEUM, DEHRADUN

ON

SEPTEMBER 19-20, 1988

No. J-13013/1/87-Gen-XXI
Government of India
Ministry of Petroleum & Natural Gas
....

New Delhi, dated the 15th Nov, 88

To,

1) All members of Scientific Advisory Committee(by name)
2) All participants as at Annexure(by name)
3) CMDs of BPCL, HPCL, MRL, CRL, BRPL, and Dir(Refineries), IOC

Subject:- Minutes of the 21st Meeting of the Scientific Advisory Committee held at Indian Institute of Petroleum Dehradun on 19-20th Sept. 1988

Sir,

I am directed to forward herewith a copy of the minutes of the Scientific Advisory Committee meeting held at Indian Institute of Petroleum on 19-20th September, 1983.

Yours faithfully,

T N Parameswaran

(T.N.Parameswaran)
Under Secretary to the Govt. of India
T.No. 382583

Copy alongwith copy of minutes to:-

1) Adv(E)/Adv(R)
2) JS(E)/JS(R)/JS(M)/JSFA
3. PS to Secretary(P)
4. FA&CAO, OIDB, New Delhi.

MINUTES OF THE 21ST MEETING OF THE SCIENTIFIC ADVISORY COMMITTEE HELD AT INDIAN INSTITUTE OF PETROLEUM, DEHRADUN ON THE 19TH AND 20TH SEPTEMBER, 1983

The list of participants in the meeting is attached as Annexure.

21.1 WELCOME

21.1 The Chairman welcomed the members and participants for making it convenient to attend the meeting. He thanked Dr. R.Krishna, Director, Indian Institute of Petroleum for arranging the meeting at IIP Dehradun and requested him to express his views.

21.1.2 Dr. R. Krishna greeted the participants and said that Senior Scientists of the Institute had also been invited to participate in the proceedings.

21.2 CONFIRMATION OF THE MINUTES

21.2.1 The minutes of 20th meeting were circulated to the members earlier. The Chairman said that LIL had written a letter about point No. 20.6.4. After a brief discussion, the Chairman clarified that minutes of the sub-committee on Additives do not form a part of the minutes of SAC. Point 20.6.4 takes care of all the points raised by LIL.

21.2.2 It was agreed that on page 5 of the minutes (para 20.6.5) the last line would be changed to read Scientific literature or patents and our own perception.

21.2.3 With the above observations the minutes of the 20th meeting were passed and confirmed.

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21.3 FUEL SPECIFICATIONS DIESEL

21.3.1 The Chairman remarked that the note was a fairly exhaustive one and was circulated earlier. Dr. Mukhopadhyaya said that it has been updated since then. Shri N.V. Raje presented the paper with the help of slides. It was mentioned that there was a need to improve the IS standard for high speed diesel particularly. ith regard to cetane number, aromatic content, volatility and Sulfur levels. Accordingly a Diesel Fuel Specification has been proposed for India with a maximum limit for Sulfur 0.5(wt %) distillation (90% pt 375^{0}C), cetane number(45 minimum) and storage stability test. A minimum flash point of 45^{0}C was also proposed. The Chairman complimented Shri Raje and his colleagues who participated in the preparation of this report. This was followed by detailed discussions.

21.3.2 Shri Mathur stated that the current Indian Specifications had been adopted after due consideration in various forums of ISI. Many aspects of Fuel efficiency, emissions etc could also be related to Vehicle maintenance and roads rather than Fuel quality. Indian conditions with regard to vehicle design /road conditions as well as our supply demand position for petroleum products do not seem t have been consi ' red in this note,

Some dialogue had started earlier in the Energy Board and recently in the BIS, A committee had been set up by BIS to examine the cost benefit aspects of HSD specifications. The subject of Diesel Fuel would be covered in the forthcoming seminar organised by CHT. Chairman also mentioned that our specifications should cater to our needs. It should also be ensured that a first class fuel is not wasted in a poor quality engine.

21.3.3 Shri S Singhal gave a detailed account of his reactions to the subject saying that in view of very large requirements of diesel oil vis-a-vis gasoline the subject needed careful attention. Many of the accompanying problems can be taken care of by engine manufacturers. There are two types of engines, direct injection and indirect injection. The former cover almost 95% of engine population in India, whereas the advanced countries were now using the latter types for high speed car applications. Their fuel had been designed for these indirect injection engine He also gave a summary of COMP study to the Chairman. In his view the data presented therein pertained to the fuel requirements abroad rather than for India. He, however proposed a more rigorous check on volatility and recommended FBP in place of 90% point to ensure proper volatility. As far as cetane number is concerned a value of 42-45 should be on sulfur he agreed with the proposed limit of 0.5% wt. He also advocated introduction of CFPP test, and felt that the storage stability figures would depend on the time after production when the sample is drawn for test.

21.3.4 Shri Deshpande stated that many refineries produced high cetane and low sulfur diesel. If 90% point is reduced to 357°C it would result in a 5-6% reduction in Diesel production. Dr. Pundir stated that as far as FBP is concerned CCR on 10% residue also take care of the tail ends.

21.3.5 Shri S. Vishwanathan of BPCL gave information on several aspects of diesel production. Generally not more than 15% cracked stock goes in diesel. The pour point also limits the FBP.

21.3.6 Dr. Krishnamurthy felt that problem of Cracked fuels and end point has not been examined. Experimental data would be desirable with regard to these.

21.3.7 Dr. G. Rao of CHT and Shri R. Sethuraman of IPCL felt that there was not need to do actual experimentation for flash point. The current specifications are adequate.

21.3.8 Dr. P.K. Mukhopadhyaya commented that poor fracti-onation results in loss of diesel yield particularly from Vacuum Distillation Unit (VDU). Dr. Krishna suggested packings to improve efficiency of vacuum distillation units.

21.3.9 Summing up the Chairman said that there has been very valuable and thorough discussion on diesel fuel. He again commended the work of IOC in compiling the information presented. It was concluded that(a) there was a need to examine the specifications of diesel fuel and (b) it would be desirable to aim for a surplus level of 0.5%.wt.

2 SPECIFICATION OF MOTOR GASOLINE(NOT PREPARED BY LIL)

2 A brief note presented by Dr. K L Mallik, stressed the need to replace research Octane number by anti knock index. He felt that a survey of octane requirement of Indian Vehicle should be made as well. There may also be a need to introduce a different octane grade of motor gasoline for two stroke engine. With respect to vapour locking problem, no precise data are available. It was suggested that IIP should make studies on V/L ratio of currently marketed gasolines. Vehicle manufacturer views may also be sought on the issue. FBP reduction from 215°C to 205°C was also proposed to keep in line with international practice. Dr. Mallik pointed out that olefin content of the marketed gasoline is quite high and cases of gasoline having as high as 47% olefine have been reported. He suggested to incorporate specification limit of olefins 15% vol.max. Estimation of iso-olefins was also emphasised in view of its effect on stability. For oxidation stability Dr. Mallik questioned the adequacy of stability test currently being followed.

21 Shri Sudhir Singhal pointed out that there is a need to include a parameter related to preignition tendency of 2 stroke and 4 stroke engines and also stressed the need to enforce a limit on olefins content as engine performance and lubrication system requirement are greatly influenced by it. However some members did not agree. Based on preliminary investigations Mr Singhal also pointed out that octane requirement of 2 stroke engine appear to be lower than that for 4 stroke engines. He mentioned about the worth being taken up by a Committe of BIS who examined the cost benefit aspects of gasoline specifications.

21.4.3 Dr. Mukhopadhyaya emphasised introducing $\frac{R+M}{2}$ in place of RON and need to phase out lead content and to review oxidation stability requirements.

21.4.4 Prof Sharma appreciated the points raised by Dr. Mallik in his presentation and summed up the discussion with the remarks that we should keep in mind high level of consumption of MS in 2 stroke engine and should consider the requirements of new designs of 2 stroke and 4 stroke vehicles coming up in the market. It appears that Olefin content of motor gasoline also needs to be taken care of in the specification directly or indirectly.

21.5 SPECIFICATION OF KEROSINE

21.5.1 Dr. Joshi made an elaborate presentation on kerosine covering application and requirements of various types of illuminating and heating appliances and quality aspects of kerosine and emphasised review of the specification particularly of smoke point, sulphur and flash point in the context of present kerosine quality.

21.5.2 Dr. Mukhopadhyaya also circulated IOC R&D comments in the form of note and recommended revisions in colour Saybolt(+16) sulphur content(0.10%wt) Flash point (38 ^{o}C) min. and smoke point(25 mm) min.

21.5.3 Shri Juneja commented on need to study cost effectivenes of the changes proposed. Shri Sudhir Singhal and some other members suggested that work related to improvements in illuminating appliances should also be taken up.

21.5.4 The Chairman summed up the discussion as under

- Improved design of lump and wick quality is required.
- There is a need to bring down sulphur content.

21.6 FUGITIVE EMISSIONS FROM REFINERIES(CHT)

21.6.1 A presentation was made by Shri S.Venkataraman of Centre of High Technology. The presentation covered emission of NO_x and SO_2 in Gujarat Refinery but no information was available related to hydrocarbon emission. However some data pertaining to BPCL were available.

21.6.2 Members of the Committee felt that the data available are not adequate and Prof Sharma commented that there is a need to predict leakages emissions from different types of tanks and cooling towers and to study to what extent this can be minimised by improved design of pumps and other equipments and operational parameters. This may require continuous monitoring equipment. This subject require further study.

21.7 STATUS OF HYDROCRACKING PROJECT AT IIP

21.7. Dr. R.Krishna presented the status report on the hydrocracking project which is funded by OIDB at IIP Dehradun. A note on this subject was circulated to all the members.

21.7.2 In his presentation, Dr. Krishna covered various facts involved in the project, viz. a) catalyst preparation, b) catalyst characterization, c) feedstock and hydrocrackate characterization, d) process studies for catalyst evaluation both in microreactor and pilot plant e) hydrodynamic studies(cold flow), and f) Computer modelling of hydrocracking kinetics. He drew attention to the parallel between FCC and hydrocracking and the rationale in developing a modified zeolite-based catalyst for hydrocracking of vacuum distillates of some Indian crudes.

21.7.3 He mentioned that no standardized procedure for the catalyst evaluation in hydrocracking exists and that comparison of different catalysts even under identical conditions becomes difficult due to different nature of supports, etc. He described, therefore a novel approach for the kinetic analysis of the data through the TBP curves of hydrocrackates at different temperatures and at different LHSVs.

21.7.4 The Chairman complimented Dr. Krishna for his erudite presentation and for the remarkable progress made in this project. He desired that EIL and IOC should be involved in this project at an early stage, by way of regular meetingsand active participation. Dr. Krishna welcomed the suggestion and agreed to discussion once in three months between IIP, EIL and IOC.

21.7.5 Dr. Krishnamurth of EIL also complimented Dr. Krishna for the interesting work done at IIP, the zeal with which it was carried out and the good coordination of a number of persons involved in this project. He suggested to pool the resources of NCL in catalyst development.

21.7.6 Dr. P.K. Mukhopadhyaya remarked that a good beginning on the theoretical basis for hydrocracking has been made and wanted to discuss the scale-up strategy on which he distributed a note to all the members. He wanted to elicit ideas on reaction engineering from experts and all concerned with hydrocracking. He was of the view of creating further facilities after detailed discussion. Dr. Mukhopadhyaya's note will be taken up for discussion in the next meeting of SAC.

21.8 TWO STORKE ENGINE-DEVELOPMENT PERSPECTIVES(IIP)

21.8.1 A paper on the future development perspectives of the two stroke gasoline engines employed for Scooters, Motorcycles, Mopeds etc. was presented by Dr. R.Krishna, Chairman emphasised the importance of this class of engines as two and three wheelers consume more than 50 percent of total gasoline in the country.

21.8.2 During presentation, the major draw back of this engine i.e. short-curcuiting or bypass of 15 to 40% of fresh fuel-air mixture directly to the exhaust without taking part in combustion was pointed out and also that it results in about 1.5 times higher fuel consumption and more that 5 times unburned hydrocarbon emissions from the conventional 2 stroke engine compared to the four stroke engines. To overcome this draw back the different engine development strategies explored by researchers from time to time were presented alongwith the pecularities of the working process of small two stroke engines design. It was pointed out that design optimisation of intake, exhaust system and combustion chamber etc around the basic engine will give only minor improvements.

21.8.3 The most promising direction is the injection of fuel or fuel-air mixture after the exhaust ports are closed so that the mixture short-circiuting to the engine exhaust is totally eliminated. This would require development of an electronically or pneumatically controlled injection system. This type of engine have been shown to give fuel consumption and hydrocrabon emissions even lower than those of 4 stroke engines.

21.8.4 Another development strategy is to employ air alone for scavenging and introducing fuel air mixture from the carbuettor a little later. Engine prototype developed on this principle at IIP was described briefly and a scooter fitted with this engine was also demonstrated. This system reduces hydrocarbons by 40 to 50% and fuel consumption upto 12-14%.

21.8.5 After the presentation, Members expressed their concern on the problem covered by the two stroke engine designs currently in use on Indian Vechicles. The Chairman summed up the discussion that there is a strong need to undertake intensively the development of two

stroke engines so that the directly short circuited fuel losses are reduced drastically or entirely eliminated. This will result in substantial benefits both on petroleum conservation and environmental protection, on the national protection, on the national basis.

21.9 CARBON BLACK

21.9.1 In the previous meeting Advisor(ref) had given a background of this topic.

21.9.2 A brief discussion took place. Dr. G.Jayarma Rao requested that IIP data on CBFA as mentioned by Dr. B.S. Rawat be circulated. There is a shortage of better quantity feed stock and the scope to increase production in India is limited.

21.10 NEXT MEETING

21.10.1 The next meeting was proposed to be held in Lubrozol Bombay. The tentative date would be December 2, 1988.

21.10.2 The agenda for the meeting would include:-

1. Status Report on Lube Additives
   a.) Development to Technology for additives - LIL
   b.) Testing/certification on indigenous engines - IOC(R&
   c.) Future improvement in lubricants - LIL
   d.) New range of additives - LIL
2. Alternative methods for Ethane recovery from Natural Gas - EIL

21.11 The meeting ended with warm appreciation of IIP hospitality by the Chairman and a vote of thanks to the Chair. Visits to IIP laboratories and ONGC, KDMPIE labratories were arranged for 20.9.88

ANNEXURE

NAME	ORGANISATION
1. Prof.M.M.Sharma	B.U.D.C.T.
2. Dr. P.K.Mukhopadhyay	IOC
3. Shri P.K.Goel	PCRA
4. Shri G.Jayarama Rao	Centre for High Technology
5. Dr. R.Krishna	IIP
6. Shri R.Sethuraman	IPCL
7. Shri R.Krishnamoorth	EIL
8. Shri S.N.Mathur	Adv.(R)/M/o Petroleum &NG
9. Shri N.R.Raje	IOC
10. Shri S.K.Mukherjee	HPCL
11. Shri K.L.Mallik	LIL
12 ShJ.Bhatia	Balmer Lawrie
13. Shri O.K.Juneja	BPCL
14. Shri S.Venkatraman	CHT
15. Shri V.K.Deshpande	OCC
16. Shri D.N.Rihani	EIL
17. Shri D.K.Palit	MRL
18. Shri S.Viswanathan	BPCL
19. Shri G.C.Joshi	IIP
20. Shri S.Singhal	IIP