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HARMONIZED SYSTEM
COMMITTEE
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CLASSIFICATION OF "GAS CONDENSATES"

(Item VII.13 on Agenda)

Reference documents :

42.241 (RSC/18)
42.500 Annex B/9 (RSC/18 - Report)
42.763 (SSC/14)
42.826 (SSC/14)
42.830 (SSC/14)
42.850 Annex A/10 (SSC/14 - Report)
NR0016E1 (RSC/19)
NR0041E1 (RSC/19)
NR0045E2 Annex A/16 (RSC/19 - Report
NC0016E1 Paras. 23 and 24 (HSC/23)
NC0017E1 Paras. 54 to 57 (HSC/23)
NC0090E2 Annex E/1, para. 17 (HSC/23 – Report)
NC0090E2 Annex F/1, paras. 57 and 58 (HSC/23 – Report)

I. BACKGROUND

1. The Committee at its 23rd Session examined the conclusions of the Review Sub-Committee concerning a proposal by the Chinese Administration for the creation of a new subheading for “gas condensates” under heading 27.09.

2. The Committee took note that the Saudi Arabian Administration had submitted a technical document to the Secretariat for use in the future study of this issue.

3. The Chairman indicated that the question of the classification of gas condensates would be considered at the next session of the Committee and that the possible amendment of the Nomenclature with respect to gas condensates would be left to the next review cycle.

II. PREVIOUS STUDY

4. The proposal was first examined by the Review Sub-Committee at its 18th Session. Due to the concerns raised, the Review Sub-Committee decided to refer the matter to the Scientific Sub-Committee for advice on the following points :

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(a) appropriate definition or description of "natural gas condensates" and

(b) how the products could be distinguished from similar synthetic products of heading 27.10.

5. Taking into account the comments provided by China, the EC and the US (see Docs. 42.763, 42.826 and 42.830), the Scientific Sub-Committee at its 14th Session examined the questions posed by the Review Sub-Committee. For ease of reference, the conclusions of the Scientific Sub-Committee are reproduced below (see Annex A/10 to Doc. 42.850, SSC/14 – Report).

Definition or description of "natural gas condensates"

6. One delegate stated that, according to his information, the products under consideration were natural products obtained from the "condensation oil-deposits" already mentioned in the Explanatory Note to heading 27.09. During the throttling process, high temperature and high pressure wet gas went through the throttling valve, its temperature and pressure were reduced naturally and oil was separated by condensation. Technically, throttling was an irreversible thermodynamic process in which a gas under pressure was allowed to expand by passing into a chamber of lower pressure. He believed that this process was different from the atmospheric distillation of crude oils. Therefore, he basically agreed with the text proposed by the Secretariat in paragraph 12 of Doc. 42.763. He suggested that the expression "through throttling" be added to the end of the first indent of that text to clarify the description of the process applied. Also, another indent such as "have an octane value not exceeding 30" could be added to the text, since gas condensates were natural products having relatively low octane values.

7. However, another delegate noted that the Chinese proposal had been made with the understanding that the "gas condensates" in question were classified in heading 27.09. However, these products were "gas condensates" obtained through the processing of wet natural gas in sophisticated well-site gas plants where wet gas was separated into three components, i.e., natural gas, gas condensate and water. This processing method was completely different from a mere stabilisation and similar to the atmospheric distillation of crude oils. As such, the "gas condensates" under consideration were, in terms of their production method, different from the crude products that were marginally produced through processes listed in the Explanatory Note to heading 27.09. Therefore, he was of the view that these products could not be considered as "crude oils obtained from the stabilisation of natural gas". Nevertheless, he had no major objection to the other three indents of paragraph 12 of Doc. 42.763. He added, however, that another indent concerning the API gravity of "gas condensates" could be inserted in that text.

8. In this connection, the Chairman indicated that the information he had received from the European petroleum industry concerning the processing method applied in obtaining "gas condensates" supported the method outlined in paragraph 7 above.

9. Some delegates, however, felt that they needed more information concerning (i) the processing involved in obtaining "gas condensates" and (ii) the chemical composition and physical characteristics of these products. Clarification as to whether "gas condensates", whether natural or synthetic, were classifiable in heading 27.09 or heading 27.10 was also necessary.

How to distinguish “gas condensates” from similar synthetic products of heading 27.10

10. In this regard, there was almost consensus in the Sub-Committee that the chemical composition and physical characteristics of “gas condensates” and similar synthetic products of heading 27.10 were in fact very similar and overlapped in many cases. There was almost no practical way of distinguishing between the two groups of products.

11. After discussion, the Sub-Committee agreed that the information obtained so far was insufficient for reaching a satisfactory conclusion in respect of the definition of “gas condensates” and distinguishing them from the similar products of heading 27.10. Nevertheless, the Sub-Committee agreed to submit to the Review Sub-Committee the following text concerning the description of “gas condensates”. For the first indent, on which opinions were divided, there are two options, (1) the text drafted by the Secretariat on the basis of information provided by China and the EC and (2) an alternative text drafted on the basis of information provided by the US. Both texts have been placed in square brackets :

“Natural gas condensates :

- [are crude oils obtained from the stabilisation, immediately on extraction, of natural gas. This operation consists of extracting the condensable hydrocarbons contained in the “wet” natural gas, mainly by cooling and depressurisation [through throttling]] or
  [are obtained, at well-site gas processing plants, by condensing C4 to approximately C20 hydrocarbons contained in the “wet” natural gas];

- normally consist of [C4 to approximately C20] hydrocarbons with no unsaturated hydrocarbons or only trace amounts thereof; the main components are [C6 to C9] hydrocarbons;

- are normally clear or transparent liquids, but sometimes are yellowish or coloured;

- approximately [80] % by volume distil at about [200] °C;

- [have an octane value not exceeding 30];

- [have an API gravity of 55 to 65].”

12. In view of the Scientific Sub-Committee's indication that a definition of "gas condensates" and how to distinguish them from similar products of heading 27.10 could not be satisfactorily produced, the Review Sub-Committee at its 19th Session agreed that the proposal for a new subheading in heading 27.09 to cover "gas condensates" should not be further examined during the review cycle for the HS 2002 version.

13. It also felt that the classification of "gas condensates" should be submitted to the Harmonized System Committee together with the information obtained so far from China, the EC, the United States and Canada; administrations were invited to provide further information regarding the chemical composition, physical characteristics and definition of the "gas condensates" under consideration.

III. INFORMATION PROVIDED BY ADMINISTRATIONS

14. For the information provided by China, the EC, the US and Canada, delegates are requested to refer Docs. 42.763, 42.826, 42.830 and NR0041E1, respectively. The following additional information was received from China and Saudi Arabia :

China

15. "The production of "Gas Condensates" :

Based on the flow chart presented (see Annex I to this document), we can describe the whole production procedure of "gas condensates". Gas condensates usually stored in the terrain as gas deposits with high pressure (10~40 Mpa) and relatively high temperature (30~80°C). The gas can partly condense into a liquid phase when throttled to the pressure (5~7 Mpa) which is the request of the gas transportation. We call the liquid "gas condensate". This process just happens in the container with a large volume as the black arrowhead pointed in the flow chart. The decrease of the gas temperature is due to inflation when the pressure comes down. The basic principle is that when gas works outside the temperature will drop down.

16. The lighter components of the gas that cannot be condensed in the throttling container go through the container from the top. By a compressor, part of them will be pressed back into the deposit after the oil absorption in order to maintain the temperature of the deposit, then can exploit more "gas condensates".

17. The main component of the lighter gas after throttling is methane. But it still contains some relatively heavy composition such as C4~C5 hydrocarbons which we call "wet gas". These heavy hydrocarbons must be separated before gas transportation. Otherwise they will condense out into liquid in the gas lines and affect the efficiency of the gas transportation. Usually we can simply take them apart from methane by cooling or similar procession. With this method the methane content of the gas will be 80% or higher. We call this gas "dry gas".

18. From what we have narrated above we can say that "throttling" and "cooling" are different steps among the whole exploitation. "Gas condensates" are definitely produced in the first section.

19. The production of "Stabilisation Gas" :

"Stabilisation gas" is the conception in the crude oil disposal section. It has nothing to do with exploitation of the gas deposit.

20. The ordinary procession treating crude oil and gas to crude oil, which is suitable to transport, is sketched as follows (see Annex I to this document) :

21. In the gauge station, part of the gas and water can be separated out. This gas is called "accompanying gas".

22. The purpose of the connection station is to heat the oil in order to keep the temperature of the oil and maintain suitable viscosity. The purification station is used to dehydrate the oil. The water content of the oil passing through this station will drop down

to 0.5%. In these two stations, some lighter components will vapour out just because of the high temperature. We call these lighter components “flash vaporisation gas”.

23. In order to avoid the loss of light components during oil transportation and storage, the oil should be treated by stabilisation devices. The gas which comes from this section is called “stabilisation gas”.

24. These three types of gases will all be sent to the gas processing plant.

25. Based on the information above we can conclude that “stabilisation gas” is different from “gas condensates”. They come from treating oil and exploitation gas deposit, respectively. So we think the derivation of the gas condensates should be described as : “are crude oils obtained from immediately on extraction, of natural gas. This operation consists of extracting the condensable hydrocarbons contained in the wet natural gas, mainly by throttling procession”.

26. We also noted that the following three properties listed in the SSC/14 Report (Doc. 42.850) are not “hard” criteria. It is not suitable for Customs to operate practically;

- normally consists of [C4 to approximately C20] hydrocarbons with no unsaturated hydrocarbons or only trace amounts thereof; the main components are [C6 to C9] hydrocarbons.

- are normally clear and transparent liquids, but sometimes are yellowish or coloured.

- approximately [80]% by volume distils at about [200]°C.

27. Concerning the proposal which can distinguish "gas condensates" from similar synthetic products of heading 27.10, we have expressed our view of “octane value not exceeding 30”. But that is just a conventional idea, not a strict definition. We hope the HSC can give out a practical line between these two headings.”

Saudi Arabia

28. “Gas Condensate

Gas condensate is produced as a result of the conditioning of both well gas and crude associated gas prior to further processing. When processing well gas the condensate is separated in series of different pressure separators before diverting well gas for further processing. The other source for gas condensate is through the due point control of Associated Sour Gas to avoid liquid drop out in the sour gas transfer lines. Gas condensate is separated from the associated sour gas at the Gas Oil Separator Plants (GOSP) before sending it to gas plants. This condensate is lighter than the condensate produced through well gas processing as shown in the provided analysis. Following is a summary description for each process along with the characteristics of each type of condensate:

29. Process Description

Well Gas Processing : Figure 1 (see Annex II, page 1, to this document) shows a simplified process flow diagram for well gas processing. Wet high-pressure gas is produced and gathered from the gas wells to the gas plants via multiple trunklines. The water and the natural gas condensate associated with this gas are separated in a High Pressure (HP)

three-phase separator. The separated gas from this drum is cooled in a fin fan cooler and diverted to a Low Pressure (LP) two-phase separator, where a lighter natural gas condensate is separated. The gas from this drum is then sent to the downstream facilities for further processing. The collected natural gas condensate in the HP separator is then reduced in pressure to a Medium Pressure (MP) three-phase separator where additional sour natural gas is separated from the collected gas condensate. The gas LP and MP gas condensate are combined before shipping. This condensate is obtained by basic separation processes.

30. GOSP HC Condensate : Figure 2 (see Annex II, page 2, to this document) shows a simplified process flow diagram for a typical GOSP (Gas Oil Separation Plant) which is another source for gas condensate. In GOSPs sour gas is flashed from both the High Pressure (HP) and the Low Pressure (LP) traps. Both gas streams are combined after compressing the LP trap gas to the suction pressure of the HP compressors. The compressed sour gas is cooled to knock out the hydrocarbon condensate in order to control the sour gas dew point, which will prevent liquid drop out in the sour gas transfer lines. The separated hydrocarbon condensate is diverted to the gas plants for stripping (remove H_2S and lighter components) before shipping.

31. Since the condensates described above are by-products of the production of natural gas and crude oil, the condensate clearly falls into the definitions in heading 27.09. The lack of sophisticated processing and the composition of the condensates further support this contention. Therefore, we believe that these condensates should be placed in heading 27.09 and not 27.10."

32. A table provided by Saudi Arabia concerning "Hydrocarbon Analysis of Gas Condensates" is reproduced in Annex III to this document.

IV. SECRETARIAT COMMENTS

33. The following information was excerpted from the technical literature available to the Secretariat :

33.1 "The gas in many [oil] fields is mainly methane. Small amounts of the next higher members of the paraffin series occur in it when oil is present, and the proportions of these and other light hydrocarbons in the vapour phase rise considerably when the hydrocarbon accumulation is under high pressure and at a relatively high temperature. In the case of gas-condensate accumulations the liquid oil recovered at the surface is entirely in the vapour phase in the reservoir rock, and is roughly comparable in make-up with the gasoline fraction of more usual crude oil…

Crude oils range widely in their physical and chemical properties. Green, brown and black are common colours, and there are rare examples of almost white or straw-coloured oils…" (Modern Petroleum Technology, 4th Edition, Page 6, G.D. Hobson and W. Pohl, Applied Science Publishers Ltd.).

33.2. "Discussions of natural gas can involve the following definitions :

Associated gas : free natural gas in immediate contact, but not in solution, with crude oil in the reservoir.

Dissolved gas : natural gas in solution in crude oil in the reservoir.

Dry gas : gas where the water content has been reduced by a dehydration process or gas containing little or no hydrocarbons commercially recoverable as liquid products.

Natural gas liquids (NGL) : a liquid hydrocarbon mixture which is gaseous at reservoir temperatures and pressures, but recoverable by condensation or absorption (qv).

Nonassociated gas : free natural gas not in contact with, nor dissolved in, crude oil in the reservoir.

Wet gas : unprocessed or partially processed natural gas produced from strata containing condensable hydrocarbons.

Natural Gas liquids. Natural gases containing high concentrations of the higher hydrocarbons are processed both to reduce the potential for condensation of these higher molecular-weight compounds during transmission and subsequent use, and to recover the natural gas liquid (NGL) products which can be marketed in both the fuel and petrochemical feedstock market…

Natural gas liquids are recovered from natural gas using condensation processes, absorption (qv) process employing hydrocarbon liquids similar to gasoline or kerosene as the absorber oil, or solid-bed adsorption (qv) process using adsorbents such as silica, molecular sieves, or activated charcoal. For condensation processes, cooling can be provided by refrigeration units which frequently use vapor-compression cycles with propane as the refrigerant or by using the Joule-Thompson expansion to lower the temperature of the feed gas, or through the use of expansion turbines which both reduce the temperature of the gas and derive work for use at other points in the recovery and separation process…" (Kirk-Othmer Encyclopedia of Chemical Technology, Fourth Edition, Vol. 12, Pages 318, 326 and 327).

33.3. **Natural gasoline production.** An important phase of oil and gas production in many areas is the production of natural gasoline from gas taken from the casinghead of oil wells or separated from the oil and conducted to the natural gasoline plant. The plant consists of facilities for compressing and extracting the liquid components from the gas… The natural gasoline generally is collected by cooling and condensing the vapors after compression or by absorbing in organic liquids having high boiling points from which the volatile liquids are distilled. Many natural gasoline plants utilize a combination of condensing and absorbing techniques (McGraw – Hill Encyclopedia of Science and Technology, 8th Edition, Vol. 12, Pages 321 and 322).

33.4. "The hydrocarbon constituents in the boiling range of gasoline [below 200°C] are those that have 4 – 12 carbon atoms in their molecular structure. Thus, gasoline can vary widely in composition; even gasoline with the same octane number may be quite different…

Into the first decade of the twentieth century, the gasoline produced was that which was originally present in crude oil or which could be condensed from natural gas (so-called natural gasoline). However, it was soon discovered that if the heavier portions of petroleum … was heated…gasoline that was not originally in the crude petroleum could be manufactured…" (McGraw – Hill Encyclopedia of Science and Technology, 8th Edition, Vol.7, Page 689).

33.5. "…Table 4 (reproduced below) shows typical boiling ranges for the various crude oil fractions and typical yields from Arab light, a common crude oil. The yield and properties of these straight-run or virgin fractions are a function of the type of crude oil being distilled. Virgin naphtha can be used as gasoline, except that its octane value is very low (78 RON/75 MON). When lead could be used, it was possible to add enough lead to bring the octane up to acceptable levels (>90 RON/MON). Whereas the potential yield of gasoline directly from crude oil is less than 20%, the demand is 50%. The heavy material must be converted to lighter material and the octane of many of the existing streams improved by changing chemical

composition…" (Kirk-Othmer Encyclopedia of Chemical Technology, Fourth Edition, Vol. 12, Pages 356).

Table 4. Properties of Crude oil Fractions[a]		
Fraction	Boiling range, °C	Yield, %
gas	<0	<1
virgin naphtha		
light	0-100	18
heavy	100-200	18
gas oil/kerosene	200-400	33
residue	>400	48
[a] From Arab light crude.		

Method of Processing

34. The information provided by administrations and obtained from technical literature suggests that "wet" natural gas contains certain condensable hydrocarbons, which have to be separated from the gas in order to reduce the possibility of condensation of these higher molecular-weight compounds during transmission and subsequent use, and to recover the natural gas liquid (NGL) products which can be marketed in both the fuel and petrochemical feedstock market.

35. Such condensable constituents can be separated from the "wet gas" through three possible techniques : (I) condensation, (ii) absorption and (iii) adsorption.

36. The process outlined by China and Saudi Arabia seems to refer to "condensation". Although China calls this process "throttling", the Secretariat could not find the "throttling" process in all of the reference sources cited above.

37. Notwithstanding whether the "condensation" of natural gas technically corresponds to the Chinese term "throttling", such a process (or processes) is (are) not among the processes listed in the Explanatory Note to heading 27.09. This is perhaps because, as noted by the Saudi Arabian Administration, "gas condensates" are by-products of the production of natural gas and crude oil. That is, they are not directly obtained from oil wells, but, by processing natural gas or crude oil.

38. It is therefore up to the Committee to decide whether this processing method is similar to the stabilisation of crude oil or stabilisation of natural gas or could be considered as a "minor" process permitted under the Explanatory Note to heading 27.09.

39. If not, since the Explanatory Note to heading 27.10 states that "…the products covered by this heading are those which have undergone any processes **other than** those specified in the Explanatory Note to heading 27.09..", products obtained by "condensation" (or "throttling") should normally be included in heading 27.10 under the present provisions of the Explanatory Notes.

Nature of the Product

40. It should be noted that the Scientific Sub-Committee at its 14th Session agreed that the information obtained so far was insufficient for reaching a satisfactory conclusion in respect of the definition of “gas condensates” and distinguishing them from the similar products of heading 27.10. Nevertheless, the Scientific Sub-Committee also agreed to submit to the Review Sub-Committee the text set out in paragraph 11 above for the description of “gas condensates”. The first paragraph of this text reflects the divided opinions in the Scientific Sub-Committee.

41. China and Saudi Arabia propose that “gas condensates” be classified in heading 27.09 as products similar to crude oil.

42. According to the second indent of the description given by the Scientific Sub-Committee, the main components of “natural gas condensates” are [C6 to C9] hydrocarbons. On the other hand, according to the technical literature, the hydrocarbon constituents in the boiling range of gasoline (below 200°C) are those that have 4 – 12 carbon atoms in their molecular structure. Gasoline can vary widely in composition; even gasoline with the same octane number may be quite different. Also, it seems that, at least part of the industry and trade considers “gas condensates” as “natural gasoline” (see paragraphs 33.3 and 33.4 above).

43. It should be further noted that “gas condensates” do not contain the typical fractions of a typical crude oil, but seems to be similar to the “virgin naphtha” fraction of crude oil (see paragraph 33.5 above).

44. This supports the conclusion of the Scientific Sub-Committee that the chemical composition and physical characteristics of “gas condensates” and similar synthetic products of heading 27.10 were in fact very similar and overlapped in many cases and that there was almost no practical way of distinguishing between the two groups of products.

45. On the basis of above, “gas condensates” referred to by China seem to be similar to “virgin naphtha” or “gasoline” by comparison of their boiling ranges and their main components (e.g., [C6 to C9] hydrocarbons represent a fraction of gasoline). If this is correct, then “gas condensates” should fall in heading 27.10.

46. However, the Secretariat comments given above are based on the comparison of the information provided by administrations, preliminary conclusions of the Scientific Sub-Committee and the information found in the technical literature available to the Secretariat. It should be noted that many elements of the description of “natural gas condensates” submitted by the Scientific Sub-Committee are still in square brackets. Therefore, the Committee may wish to refer this question back to the Scientific Sub-Committee for advice on a more concrete description of “gas condensates”.

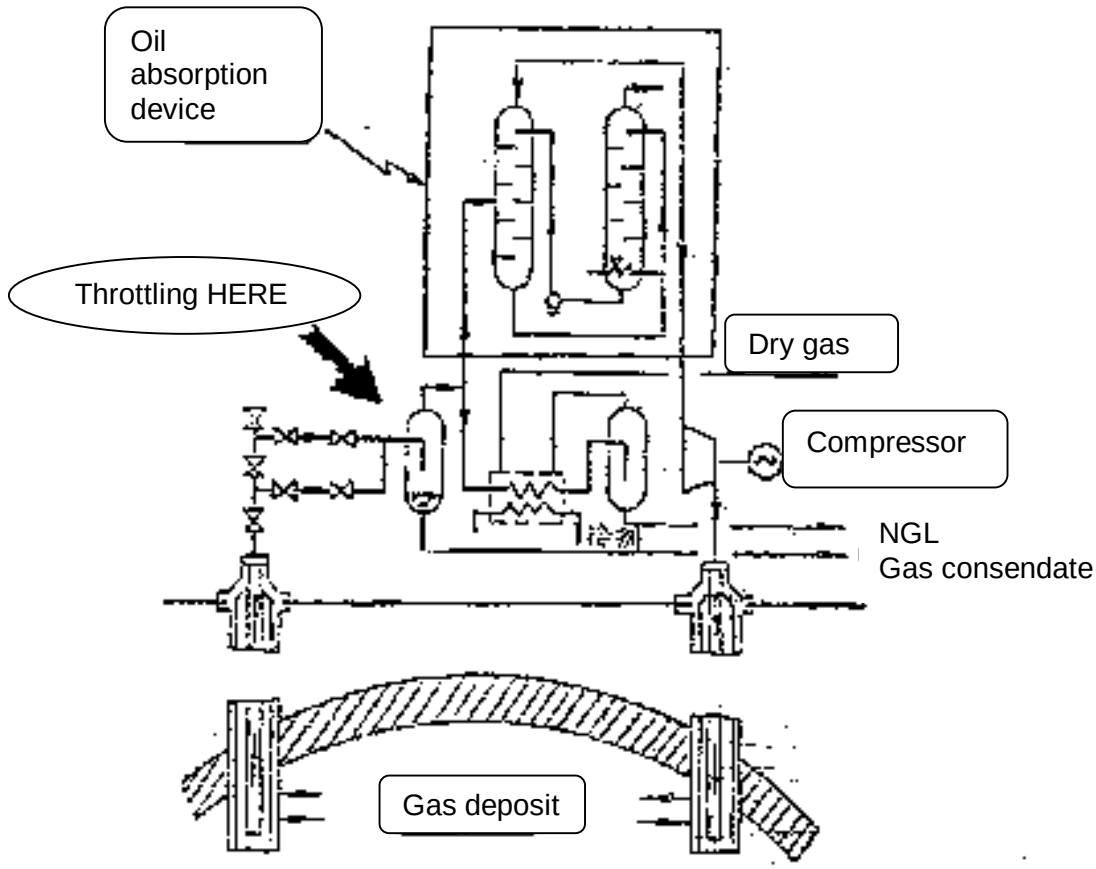
V. CONCLUSION

47. Taking into account the information provided by administrations and the Secretariat’s above comments, the Committee is invited to examine the classification of “gas condensates” and to instruct the Secretariat what further action should be taken in this regard.

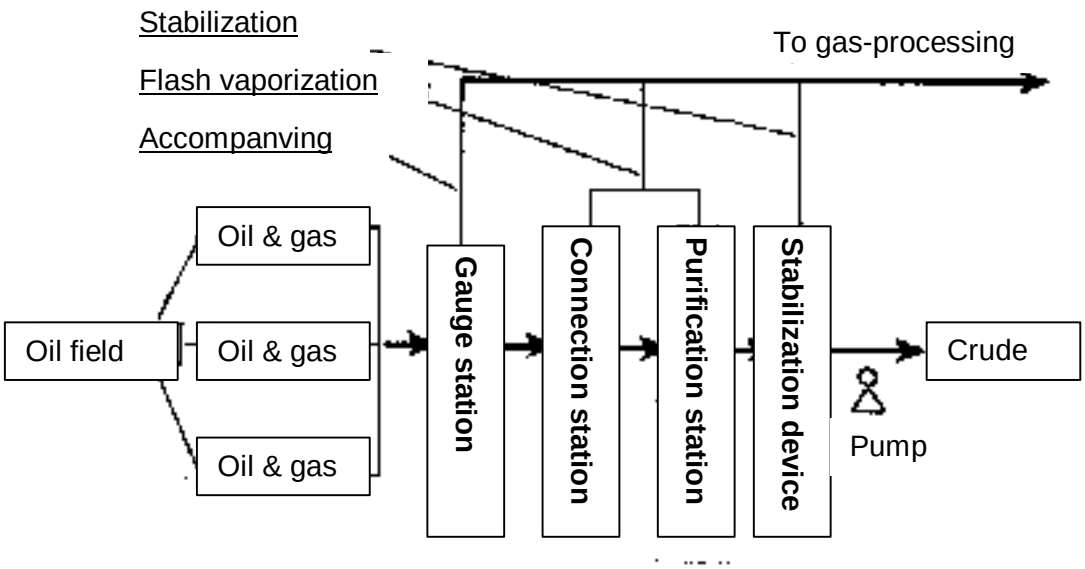
48. If the Committee wishes to refer the question back to the Scientific Sub-Committee, administrations are requested to submit to the Secretariat any further information as they consider necessary.

* * *

CHINA
Production of "gas condensates"



Production of "stabilisation gas"



Attachment to PED-074/-99

Figure # 1

Well Gas Processing

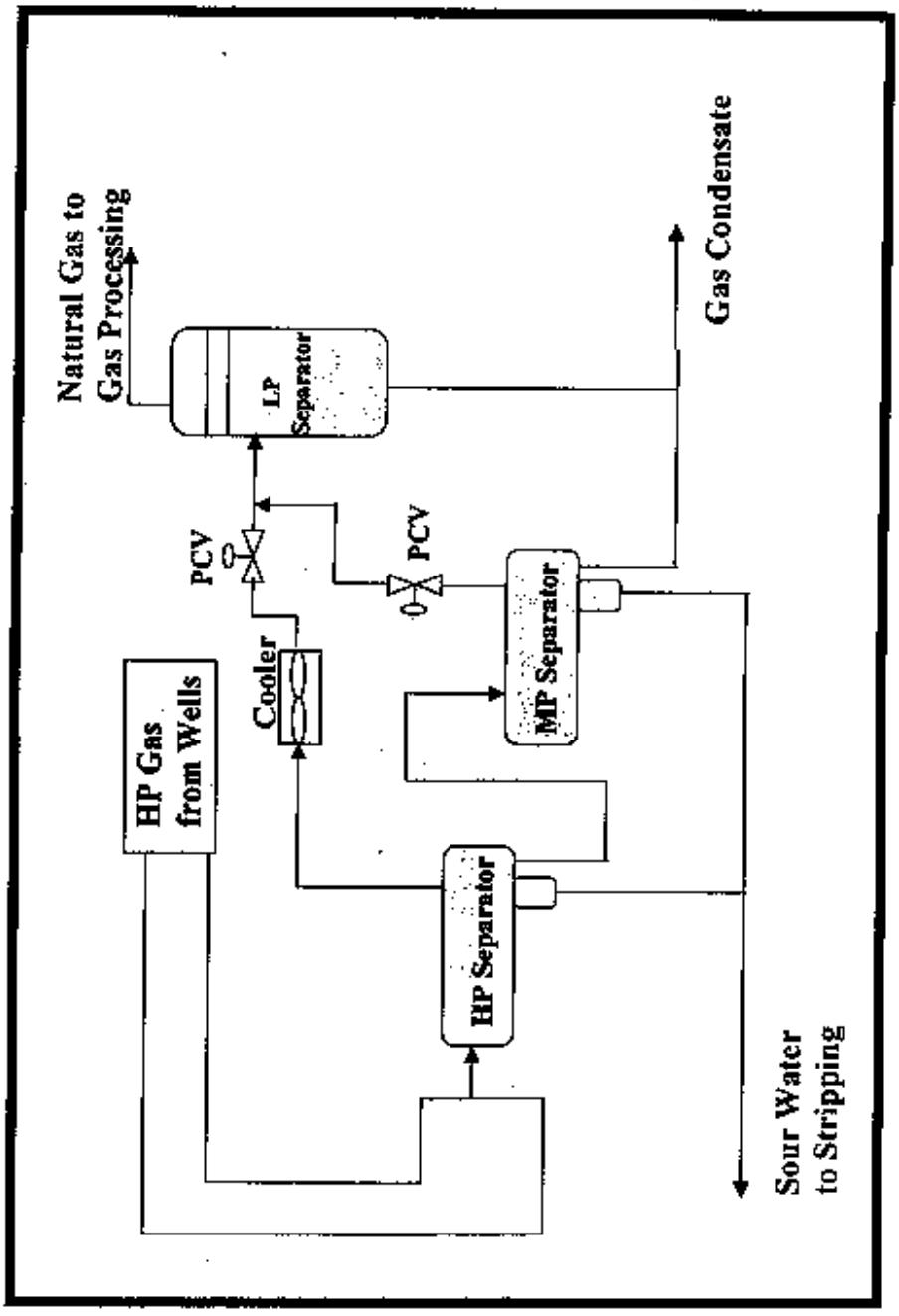
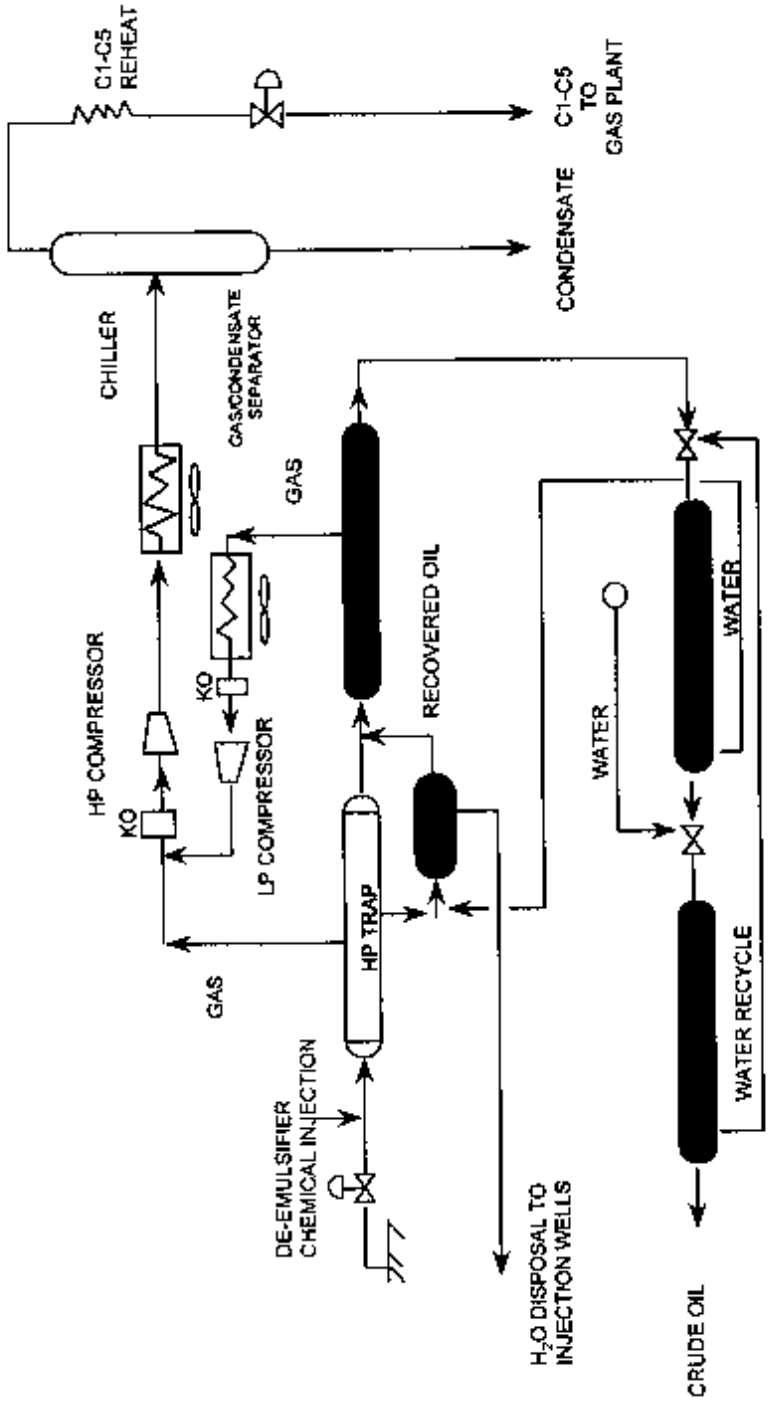


Figure #2
GOSP Flow Diagram



Hydrocarbon Analysis Gas Condensate

Below are typical hydrocarbon analyses for Well Gas and Associates Gas condensate streams.

Component	Gas Condensate (Well Gas) (Mole %)	Gas Condensate (GOSP) (Mole %)
Nitrogen	0.35	0.02
Carbon Dioxide	0.85	2.27
Hydrogen Sulfide	3.02	1.40
Methane	7.96	5.14
Ethane	3.24	8.52
Propane	3.41	15.59
i.Butane	1.36	3.06
n-Butane	3.62	13.62
i-Pentane	2.82	5.77
n-Pentane	3.34	10.97
Hexane	7.00	14.04
Benzene	1.25	-
Heptanes	10.12	10.06
Toluene	5.19	-
Octaens	8.23	5.84
Xylene	5.61	-
Nonan	4.98	2.73
n-Decane	-	0.84
n-CII	-	0.14
Decanes plus	27.69	-
Total	100.00	100.00
MW	108.9	67.28
Stand. Density (Ibm/ft^3)	47.04	39.12
API Gravity	56.68	91.35
Viscosity (cP)	0.547	0.1769
Color	Normally Clear	Normally Clear

1. Properties of Decanes Plus :
   API Gravity @ 60°F 44.0
   Density gm/cc @ 60 °F 0.805
   Molecular Weight 190

2. The compositions of the sour gas and consequently the liquid hydrocarbon condensate vary slightly from GOSP to another GOSP depending on the operating parameters of each GOSP, the crude oil composition, and the ambient weather temperature.