經濟部暨所屬機關因公出國人員報告書
（出國類別：洽公）

# 赴卡達杜哈「擔任 LNG 裝船買方代表」報告書

服務機關：台灣中油公司永安液化天然氣廠
姓名職稱：劉正鈞 副廠長/錢明雄經理
派遣國家：卡達
出國期間：98 年 3 月 11 日至 3 月 14 日
報告日期：98 年 5 月 20 日

# 摘要：

本公司與卡達簽訂之 LNG 採購契約以 FOB 方式計量計價，因此職等奉派至裝貨港(Ras Laffan, Qatar)擔任 98 年第三次 FOB 裝貨驗證人員，見證計量計價。

買方(buyer)至裝貨港見證有關計量計價流程，包括船上儲槽冷卻(cooling-down)、裝貨前測量核對見證(CTM open, custody transfer measurement opened)、裝貨氣體樣品(composite gaseous sample)開始收集、裝貨流程(delivery of LNG procedure)、停止氣體樣品收集與分裝樣品鋼瓶 、裝貨後測量核對見證(CTM close, custody transfer measurement closed)及文件簽認、裝貨樣品分析(analysis of LNG loaded)及報告簽認、核對裝貨 MMBTU 等相關作業。

# 目次：

# 壹、 目的

本公司與卡達簽訂之 LNG 採購契約以 FOB 方式計量計價，因此職等奉派至裝貨港(Ras Laffan, Qatar) 擔任 98 年第三次 FOB 裝貨驗證人員，見證計量計價。

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由於裝貨時，每個環節皆會影響 LNG 購買成本，更加彰顯出裝貨、計量、取樣及分析流程對 LNG 交易之重要性，尤其在國際油價日益高漲下，LNG 價格亦隨著上揚，因此，力求對 LNG 裝載流程深入了解與提升重要技能，以確保 LNG 交易在公平公正前提下，達成合理購買 LNG 之目的。

# 貳、 過程

| 日　　期 | 行　　程 | 過 程 概 述 |
|---|---|---|
| 98 年 3 月 11 日 | 台北→曼谷→卡達 | 起程 |
| 98 年 3 月 12 日 | 卡達(多哈) | 見證 LNG 裝載 |
| 98 年 3 月 13 日 | 卡達(多哈) | 見證 LNG 裝載 |
| 98 年 3 月 14 日 | 卡達→香港→台北 | 回程 |

# 參、 報告內容

赴卡達多哈，轉至 Ras Laffan Industrial City 見證第四船 FOB 貨氣裝船，主要見證裝貨港有關計量計價流程，包括 LNG 裝載前船艙溫度檢測、裝貨前測量核對見證、裝貨氣體樣品開始收集、裝貨流程、停止氣體樣品收集與分裝樣品鋼瓶 、裝貨後測量核對見證及文件簽認、裝貨樣品分析及報告簽認、核對裝貨 MMBTU 等相關作業。詳述如下:

一、船上會議(on-board meeting)

依裝貨前會議議題(Pre-Loading Meeting Agenda)，分三大項安全檢查(safety)、通訊(communications)與操作(operations)討論說明，參與者為賣方(loading master)、買方代表(buyer’s representative)、船方與公證(surveyor)。

二、船上裝貨前測量(Opening CTMs)

由船方通知買賣方及公證見證並列印報表，事先需確認 Vapor manifold shut 與停止 Gas burning。然後再核對列印報表中溫度、液位與容積。

(一)、溫度部分區分為裝貨前 LNG 液體溫度與裝貨前冷卻溫度(Cooling down temperature)兩種。

1、裝貨前 LNG 液體溫度是由每個液體 sensor 溫度之算術平均所得。

2、裝貨前冷卻溫度(Cooling down temperature) 則從底部算起 4 個 sensor 算術平均所得，需要冷卻溫度條件會隨不同類型 LNG 船不同而不同，依合約執行細則(IP) Moss type (球型槽)為-110℃，Membrane type(方型槽)則為-130℃。

(二)、容積以校正後液位，利用船上 Gauge table 轉換成容積。校正液位(Correction Level)= 平均液位(Average Level)+伏仰差(Trim correction)+傾斜差(List correction)。

三、開始收集氣體樣品

取樣系統如圖-1，在全量裝貨後五分鐘，開始收集氣體樣品，詳細步驟如下:

1、確認曝氣步驟時之所有閥及流量計皆已關閉。

2、打開取樣主閥(V1)。

3、打開閥 V3、V4 與 V6。

4、調整下游壓力(PR)為 1.3barg。

5、調整(F12)氣體樣品進入 Gas Holder 流量為 0.9 SLPM(參考裝載量及速率)。

6、調整(F13)旁通流量為 0.6 SLPM。

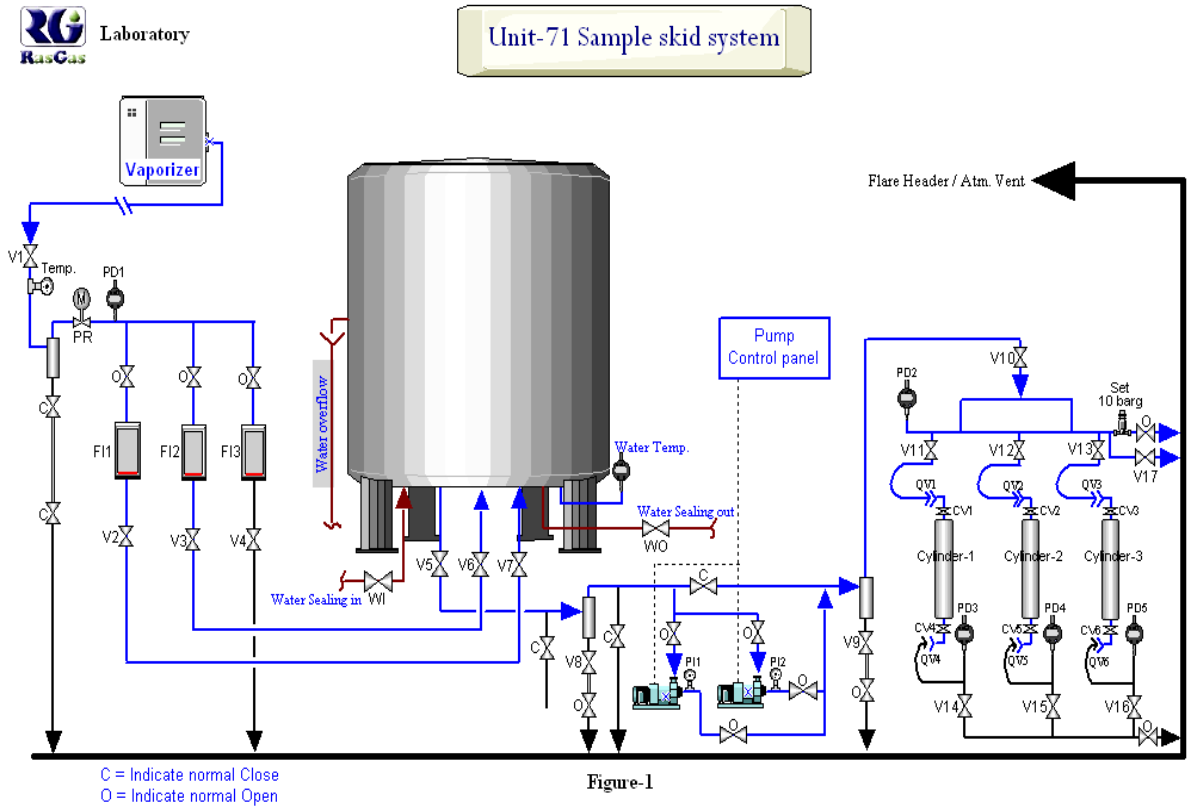


圖-1 取樣系統示意圖

四、停止收集氣體樣品及分裝樣品

在減量裝貨(rate down)時，停止收集氣體樣品，待穩定後再分裝。

(一)、停止收集氣體樣品

1、將進口罰 V6、V3 及旁通閥 V4 關閉。

2、將調壓閥 PR 關閉。

(二)、氣體樣品分裝

1、待收集槽穩定(停止收集氣體樣品後 30 分)。

2、固定三瓶取樣鋼瓶於鋼瓶架上，並將快速接頭連接好。

3、打開閥 CV4~CV6 與 V14~V16 將取樣鋼瓶卸壓。

4、關閉閥 V14~V16，打開閥 V5 和 V10 準備吹除取樣管水份。

5、打開壓縮機以逐次建壓(4.0 barg)Purge 方式，吹除取樣管水份至少三次。

6、逐瓶 Purge 取樣鋼瓶，先建壓至 6.0 barg 然後釋壓，每隻鋼瓶五次。

7、當最後一次取樣鋼瓶 Purge 後，打開所有取樣鋼瓶進出口 Flush 至少一分鐘。

8、關閉取樣鋼瓶出口閥 V14~V16，開始灌裝取樣鋼瓶至 6.0 barg。

9、由公證人員及買方代表見證確認並簽封。

10、開閉壓縮機及取樣管排放。

11、三瓶 6 barg 鋼瓶，一瓶在 RasGas 分析，一瓶隨船至卸貨港比對分析，最後一瓶保留在裝貨港。

五、船上裝貨後測量(Closing CTMs)

由船方通知買賣方及公證見證並列印報表，核對列印報表中溫度、液位與容積，核對方式與船上裝貨前測量相同。

1、確認後裝貨容積及 LNG 溫度作為計算 LNG 船裝載 MMBTU 用。

2、簽認相關文件。

六、樣品分析與結果核對

(一)、樣品分析

利用氣相層析儀(Gas Chromatograph, GC)來分析，步驟如下：

1、先分析參考標準氣體至少兩次，且其重覆性需符合合約執行細則(IP)要求。

2、待參考標準氣體分析符合 IP 要求，再分析樣品亦至少兩次，且其重覆性也需符合合約執行細則(IP)要求。

3、列印出氣相層析儀分析圖譜。

(二)、分析結果核對

1、將氣相層析儀分析圖譜面積，建入依合約執行細則(IP)要求之程式，核對各成份重覆性。

2、計算出 LNG 各成份含量(mol %)並核對。

3、計算出 LNG 船裝載 MMBTU。

七、核對裝貨 MMBTU

以裝貨容積($M^3$)、裝貨後 LNG 液體溫度(℃)及 LNG 各成份含量(mol %)。依 IP 規定計算出裝載 BTU 量($Q_D$)，再扣除補償 BOG 量($T_A$)才可獲得調整後裝載 BTU 量($Q_{AD}$)。核對無誤由公證及賣方代表簽認。

八、結論

此次 LNG 船共載 143510 $M^3$，LNG 成份如表一，裝載 BTU 量為 3,280,740 MMBTU。98 年 3 月 13 日上午離開卡達 Ras Laffan 港至台灣永安卸收港。

表一：LNG 成份

| Component | | Composition (MOL %) |
|---|---|---|
| Methane | $CH_4$ | 92.97 |
| Ethane | $C_2H_6$ | 6.16 |
| Propane | $C_3H_8$ | 0.17 |
| Iso-Butane | i-$C_4H_{10}$ | 0.01 |
| Normal Butane | n-$C_4H_{10}$ | 0.01 |
| Iso-Pentane | i-$C_5H_{12}$ | 0.00 |
| Normal Pentane | n-$C_5H_{12}$ | 0.00 |
| Hexane Plus | $C_6H_{14}^+$ | 0.00 |
| Nitrogen | $N_2$ | 0.68 |
| Oxygen | $O_2$ | 0.00 |
| Carbon Dioxide | $CO_2$ | 0.00 |
| Total | | 100.00 |

# 肆、心得與建議

職等擔任此 FOB 裝貨驗證人員，在船上裝貨期間，對 LNG 船艙預冷時機及裝貨前(BEFORE LOADING)之 CTM 所量測之船艙最下面一點溫度點係液體或氣體頗多疑惑，隨即與賣方裝貨代表、船上船長、大副、公證人員等討論，稍有不解處，劉副廠長即刻以手機詢問事業部相關人員以釐清相關問題，疑惑頓時去除，此乃此趟行程收穫之一。

經本次實際參與 LNG 裝貨港見證，對於日後 LNG 裝卸流程及環節如靠泊、Cooling、LNG 裝載、裝貨前後帳量及裝貨時取樣分析計量等，更加認識了解，進而更能體會落實 LNG 交易公平及可靠性之重要。

# LNG TANKER BILL OF LADING

## ORIGINAL

| | | |
|---|---|---|
| **Consignor / Shipper**<br>**RAS GAS** | **Parcel No.** | **B/L No.**<br>**EJ009 (RG-EJN-024L)** |
| **Consignee or order**<br><br>**CPC CORPORATION** | **Notify Party**<br><br>**CPC CORPORATION TAIWAN** | |
| **Name of Tanker "EJNAN"** | **Charterparty date 19.06.2008** | |
| **Port(s) of Loading**<br>**RAS LAFFAN** | **Port(s) of Discharging**<br>**YUNG AN** | |
| **ECN** | **SCAC/UIC No** | |

QUANTITY AND GRADE AS SUPPLIED BY CONSIGNOR

Shipped on board in bulk at the Port(s) of Loading in apparent good order and condition under the deck of the Tanker and to be delivered (subject to the liberties, conditions, exceptions and limitations hereinafter contained) and in the like order and conditions at the Port(s) of Discharging or so near thereto as she may safely get and there discharge always safely afloat the Cargo specified below.

| QUALITY AND QUANTITY OF LIQUEFIED NATURAL GAS AS PROVIDED BY CONSIGNOR | | |
|---|---|---|
| NETT QUANTITY DELIVERED | 143510 | M3 |

| TANKER CONDITIONS | |
|---|---|
| AVERAGE VAPOUR TEMPERATURE BEFORE LOADING | - 126.3 C |
| AVERAGE LIQUID TEMPERATURE BEFORE LOADING | 0.0 C |
| AVERAGE LIQUID TEMPERATURE AFTER LOADING | - 160.8 C |
| AVERAGE VAPOUR PRESSURE BEFORE LOADING | 1149 mBAR |
| AVERAGE VAPOUR PRESSURE AFTER LOADING | 1136 mBAR |

In accepting this Bill of Lading, the Merchant expressly accepts and agrees to the terms of carriage set out on this page and clauses 1 to 8 inclusive on the reverse side of this Bill of Lading which are hereby incorporated.

In witness whereof the master or Agent of the said Tanker has signed the number of Bills of Lading indicated below all of this tenor and date any one of which being accomplished the others shall be void.

| | | | |
|---|---|---|---|
| **Freight**<br>**F.O.B** | | **Place of Issue**<br>**RAS LAFFAN** | |
| **No. of Original Bills of Lading** | **Three (3)** | **Date of Issue** | **13.03.2009** |
| **Name of Master: Davorin Kristicevic**<br><br>**Name of Agent**<br>Nakilat Agency Co.Ltd | | **Signature of Master/Agent on behalf of master***<br>(as servant and agent of [name of Owner] as the Carrier) | |

S.S. EJNAN
Peninsula LNG Transport No. 4 Ltd.

# LNG TANKER BILL OF LADING

## ORIGINAL

| | | |
|---|---|---|
| **Consignor / Shipper**<br>**RAS GAS** | **Parcel No.** | **B/L No.**<br>**EJ009 (RG-EJN-024L)** |
| **Consignee or order**<br><br>**CPC CORPORATION** | **Notify Party**<br><br>**CPC CORPORATION TAIWAN** | |
| **Name of Tanker "EJNAN"** | **Charterparty date 19.06.2008** | |
| **Port(s) of Loading**<br>**RAS LAFFAN** | **Port(s) of Discharging**<br>**YUNG AN** | |
| **ECN** | **SCAC/UIC No** | |

QUANTITY AND GRADE AS SUPPLIED BY CONSIGNOR

Shipped on board in bulk at the Port(s) of Loading in apparent good order and condition under the deck of the Tanker and to be delivered (subject to the liberties, conditions, exceptions and limitations hereinafter contained) and in the like order and conditions at the Port(s) of Discharging or so near thereto as she may safely get and there discharge always safely afloat the Cargo specified below.

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S. EJNAN
Peninsula LNG Transport No. 4 Ltd.
NYK LNG Shipmanagement(UK)Ltd.

# LNG TANKER BILL OF LADING

COPY

| | | |
|---|---|---|
| **Consignor / Shipper**<br>**RAS GAS** | **Parcel No.** | **B/L No.**<br>**EJ009 (RG-EJN-024L)** |
| **Consignee or order**<br><br>**CPC CORPORATION** | **Notify Party**<br><br>**CPC CORPORATION TAIWAN** | |
| **Name of Tanker "EJNAN"** | **Charterparty date 19.06.2008** | |
| **Port(s) of Loading**<br>**RAS LAFFAN** | **Port(s) of Discharging**<br>**YUNG AN** | |
| **ECN** | **SCAC/UIC No** | |

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| **Name of Master: Davorin Kristicevic**<br><br>**Name of Agent**<br>Nakilat Agency Co.Ltd | | **Signature of Master/Agent on behalf of master***<br>(as servant and agent of [name of Owner] as the Carrier) | |

S. EJNAN
Peninsula LNG Transport No. 4 Ltd.

# CUSTODY TRANSFER DATA
# AFTER LOADING

COPY

| | | | | | |
|---|---|---|---|---|---|
| SHIP NAME | : | EJNAN | VOYAGE NO. | : | EJ009(RG-EJN-024L) |
| CARGO NO. | : | RL2-CPC01-2009-003 | PORT | : | RAS LAFFAN / BERTH#3 |
| GAS OFFICER | : | TONKO SIMONELLI | BERTH | : | |
| DATE | : | March 13, 2009 | TIME OF MEASUREMENT | : | 05:37 - 05:38 LT |
| TRIM | : | 0.00 m EVEN BY : INCLINOMETER | LIST | : | 0.02 ° PORT BY : INCLINOMETER |

| | TANK 1 | TANK 2 | TANK 3 | TANK 4 | TOTAL/AVG |
|---|---|---|---|---|---|
| TEMPERATURE (°C) | | | | | |
| TOP (VAPOUR) (T6) | -118.7 V | -118.7 V | -119.6 V | -120.3 V | |
| 95 % (T5) | -160.8 L | -160.8 L | -160.8 L | -160.9 L | |
| 80 % (T4) | -160.8 L | -160.7 L | -160.8 L | -160.8 L | |
| 50 % (T3) | -160.7 L | -160.7 L | -160.7 L | -160.8 L | |
| 10 % (T2) | -160.7 L | -160.7 L | -160.7 L | -160.8 L | |
| BTM (T1) | -160.7 L | -160.7 L | -160.7 L | -160.8 L | |
| AVERAGE VAPOUR TEMP.(°C) | -118.7 | -118.7 | -119.6 | -120.3 | -119.3 |
| AVERAGE LIQUID TEMP. (°C) | | | | | -160.8 |
| VAPOUR PRESSURE (mbarA) | 1137 | 1137 | 1136 | 1134 | 1136 |
| LEVEL MEASUREMENT(m) | | | | | |
| 1ST | 27.064 | 26.904 | 26.912 | 26.950 | |
| 2ND | 27.064 | 26.904 | 26.912 | 26.950 | |
| 3RD | 27.064 | 26.904 | 26.911 | 26.950 | |
| 4TH | 27.064 | 26.903 | 26.911 | 26.950 | |
| 5TH | 27.064 | 26.903 | 26.911 | 26.950 | |
| AVERAGE LEVEL (m) | 27.064 | 26.904 | 26.911 | 26.950 | |
| TRIM CORRECTION (m) | 0.000 | 0.000 | 0.000 | 0.000 | |
| LIST CORRECTION (m) | 0.000 | 0.000 | 0.000 | 0.000 | |
| CORRECTED LEVEL (m) | 27.064 | 26.904 | 26.911 | 26.950 | |
| THERMAL CORRECTION(m) [FOR REFERENCE ONLY] | 0.009 | 0.009 | 0.009 | 0.009 | |
| VOLUME ($m^3$) | 21808.354 | 42293.841 | 42296.949 | 37215.248 | |
| VOLUME SUMMED($m^3$ @ -160°C) | | | | | 143614.392 (B) |

| | COMPANY | PRINT NAME | SIGNATURE |
|---|---|---|---|
| BUYER | CPC TAIWAN | CHENG-CHUN LIU | |
| SELLER | RAS GAS | MUZAKKIR.S | |
| MASTER | NYK | DAVORIN KRISTICEVIC | |
| SURVEYOR | SGS QATAR | RICHARD D. | |

RasGas Company Limited Commercial & Shipping Group

SGS QATAR 2

S.S. EJNAN Peninsula LNG Transport No. 4 Ltd.

COPY

# CERTIFICATE OF LOADING

SHIP NAME : EJNAN
VOYAGE NO. : EJ009(RG-EJN-024L)

CARGO NO. : RL2-CPC01-2009-003
PORT NAME : RAS LAFFAN / BERTH#3
BERTH :

**BEFORE LOADING**

DATE : March 12, 2009
TRIM : 0.00 m EVEN BY : INCLINOMETER

TIME OF MEASURMENT : 13:01 - 13:02 LT
LIST : 0.04 ° STBD BY : INCLINOMETER

| | |
|---|---|
| AVERAGE VAPOUR TEMP.(°C) | -126.3 |
| AVERAGE LIQUID TEMP. (°C) | 0.0 |
| AVERAGE VAPOUR PRESS.(mbarA) | 1149 |

| | TANK 1 | TANK 2 | TANK 3 | TANK 4 |
|---|---|---|---|---|
| AVERAGE LEVEL (m) | 0.067 | 0.030 | -0.008 | 0.035 |
| CORRECTED LEVEL (m) | 0.068 | 0.032 | 0.000 | 0.037 |
| VOLUME ($m^3$) | 34.340 | 34.679 | 0.000 | 35.233 |

VOLUME SUMMED($m^3$ @ -160°C) 104.252 (A)

**AFTER LOADING**

DATE : March 13, 2009
TRIM : 0.00 m EVEN BY : INCLINOMETER

TIME OF MEASURMENT : 05:37 - 05:38 LT
LIST : 0.02 ° PORT BY : INCLINOMETER

| | |
|---|---|
| AVERAGE VAPOUR TEMP.(°C) | -119.3 |
| AVERAGE LIQUID TEMP. (°C) | -160.8 |
| AVERAGE VAPOUR PRESS.(mbarA) | 1136 |

| | TANK 1 | TANK 2 | TANK 3 | TANK 4 |
|---|---|---|---|---|
| AVERAGE LEVEL (m) | 27.064 | 26.904 | 26.911 | 26.950 |
| CORRECTED LEVEL (m) | 27.064 | 26.904 | 26.911 | 26.950 |
| VOLUME ($m^3$) | 21808.354 | 42293.841 | 42296.949 | 37215.248 |

VOLUME SUMMED($m^3$ @ -160°C) 143614.392 (B)

VOLUME LOADED ($m^3$) 143510.140 (B) - (A) = 143510

| | COMPANY | PRINT NAME | SIGNATURE |
|---|---|---|---|
| BUYER | CPC TAIWAN | CHENG-CHUN LIU | |
| SELLER | RAS GAS | MUZAKKIR.S | |
| MASTER | NYK | DAVORIN KRISTICEVIC | |
| SURVEYOR | SGS QATAR | RICHARD D. | |

RasGas Company Limited
Commercial & Shipping Group
P.O. BOX : 24699
DOHA - QATAR

SGS QATAR 2

M.S. EJNAN
Peninsula LNG Transport No. 4 Ltd.

COPY

# CUSTODY TRANSFER DATA
## BEFORE LOADING

| | | | | | |
|---|---|---|---|---|---|
| SHIP NAME | : | EJNAN | VOYAGE NO. | : | EJ009(RG-EJN-024L) |
| CARGO NO. | : | RL2-CPC01-2009-003 | PORT | : | RAS LAFFAN / BERTH#3 |
| GAS OFFICER | : | TONKO SIMONELLI | BERTH | : | |
| DATE | : | March 12, 2009 | TIME OF MEASUREMENT | : | 13:01 - 13:02 LT |
| TRIM | : | 0.00 m EVEN BY : INCLINOMETER | LIST | : | 0.04 ° STBD BY : INCLINOMETER |

| | TANK 1 | TANK 2 | TANK 3 | TANK 4 | TOTAL/AVG |
|---|---|---|---|---|---|
| TEMPERATURE (°C) | | | | | |
| TOP (VAPOUR) (T6) | -95.3 V | -101.8 V | -105.5 V | -102.2 V | |
| 95 % (T5) | -124.4 V | -124.2 V | -125.4 V | -125.0 V | |
| 80 % (T4) | -127.6 V | -126.8 V | -127.7 V | -127.5 V | |
| 50 % (T3) | -129.9 V | -128.6 V | -129.2 V | -129.0 V | |
| 10 % (T2) | -133.1 V | -129.7 V | -130.4 V | -130.1 V | |
| BTM (T1) | -157.9 V | -138.3 V | -142.1 V | -139.8 V | |
| AVERAGE VAPOUR TEMP.(°C) | -128.0 | -124.9 | -126.7 | -125.6 | -126.3 |
| AVERAGE LIQUID TEMP. (°C) | | | | | 0.0 |
| VAPOUR PRESSURE (mbarA) | 1147 | 1154 | 1149 | 1147 | 1149 |
| LEVEL MEASUREMENT(m) | | | | | |
| 1ST | 0.067 | 0.030 | -0.005 | 0.035 | |
| 2ND | 0.067 | 0.030 | -0.009 | 0.035 | |
| 3RD | 0.067 | 0.030 | -0.009 | 0.035 | |
| 4TH | 0.067 | 0.030 | -0.009 | 0.035 | |
| 5TH | 0.067 | 0.030 | -0.007 | 0.035 | |
| AVERAGE LEVEL (m) | 0.067 | 0.030 | -0.006 | 0.035 | |
| TRIM CORRECTION (m) | 0.000 | 0.000 | 0.000 | 0.000 | |
| LIST CORRECTION (m) | 0.001 | 0.002 | 0.003 | 0.002 | |
| CORRECTED LEVEL (m) | 0.068 | 0.032 | 0.000 | 0.037 | |
| THERMAL CORRECTION(m) [FOR REFERENCE ONLY] | 0.070 | 0.069 | 0.069 | 0.069 | |
| VOLUME ($m^3$) | 34.340 | 34.679 | 0.000 | 35.233 | 104.252 (A) |
| VOLUME SUMMED($m^3$ @ -160°C) | | | | | |

| | COMPANY | PRINT NAME | SIGNATURE |
|---|---|---|---|
| BUYER | CPC. TAIWAN | CHENG-CHUN LIU | |
| SELLER | RAS GAS | MUZAKKIR.S | |
| MASTER | NYK | DAVORIN KRISTICEVIC | |
| SURVEYOR | SGS QATAR | RICHARD D. | |

RasGas Company Limited — Commercial & Shipping Group — P.O. BOX — DOHA - QATAR

SGS QATAR 2

S.S. EJNAN — Peninsula LNG Transport No. 4 Ltd.

COPY

NYK LNG Shipmanagement (UK) Ltd.

## NOTICE OF READINESS
( Membrane Type )

**To: RasGas**

Port : Ras Laffan
Date : 12-Mar-2009
Time : 11:30 LT

**S.S. " EJNAN"**

Voyage No. : EJ009 (RG-EJN-024L)
Cargo No. : RL2-CPC01-2009-003

I hereby tender you the above named LNG Tanker as having arrived at berth and being able to receive LNG for cooling/loading.

Tank No. 1 : - 137.1 °C
Tank No. 2 : - 130.9 °C
Tank No. 3 : - 132.4 °C
Tank No. 4 : - 131.6 °C

S. S. EJNAN
Peninsula LNG Transport No. 4 Ltd.
NYK LNG Shipmanagement (UK) Ltd.

Signed: Capt.Davorin Kristicevic
Master of Lng/c "Ejnan"

Received:

Date: 12 March, 2009
Time: 11:30 HRS

RasGas Company Limited
P.O. BOX : 24200
DOHA - QATAR
Commercial & Shipping Group
Terminal

Note: LNG Tanker requires cooling when the Arrival Temperature (AT) has exceeded –130°C.

# PORT LOG (LOADING / UNLOADING)

COPY

| | | | | | |
|---|---|---|---|---|---|
| 54 VESSEL | S.S. EJNAN | 57 PORT | Ras Laffan, Qatar | 60 NEXT PORT | Yung An, Taiwan |
| 55 CARGO NO. | RL2 - CPC01-2009-003 | 58 BERTH NO. | 3 | DATE | 26.03.2009. |
| 56 VOYAGE NO. | RG-EJN-024L | 59 PREVIOUS PORT | Yung An, Taiwan | MASTER | Capt. Davorin Kristicevic |

| | TIME | DATE |
|---|---|---|
| 1 ARRIVAL - END OF SEA PASSAGE | 08:30 | 12.Mar.09 |
| 2 NOTICE OF READINESS (TENDERED) | 11:30 | 12.Mar.09 |
| (ACCEPTED) | 11:30 | 12.Mar.09 |
| 3 PILOT ON BOARD - INBOUND | 09:58 | 12.Mar.09 |
| 4 ESCORT BOAT IN ATTENDANCE | | |
| 5 LET GO ANCHOR - INBOUND | | |
| 6 ANCHOR AWEIGH - INBOUND | | |
| 7 PRATIQUE GRANTED | 12:37 | 12.Mar.09 |
| 8 TUGS ALONGSIDE | | 12.Mar.09 |
| 9 FIRST LINE TO SHORE | 11:00 | 12.Mar.09 |
| 10 ALL FAST AT BERTH | 11:30 | 12.Mar.09 |
| 11 F.W.E. (FINISH WITH ENGINES) | 11:30 | 12.Mar.09 |
| 12 S.O.M.E. (STEAM OFF MAIN ENGINE) | 11:38 | 12.Mar.09 |
| 13 GANGWAY RIGGED | 11:48 | 12.Mar.09 |
| 14 FINISH SAFETY CHECK | 12:10 | 12.Mar.09 |
| 15 FINISH PRE-OPERATIONS MEETING | 12:37 | 12.Mar.09 |
| 16 START ARM CONNECTION (VAPOR) | 12:07 | 12.Mar.09 |
| (LIQUID) | 12:20 | 12.Mar.09 |
| 17 FINISH ARM CONNECTION (VAPOR) | 12:17 | 12.Mar.09 |
| (LIQUID) | 13:00 | 12.Mar.09 |
| 18 START NITROGEN PURGE | 12:38 | 12.Mar.09 |
| 19 FINISH NITROGEN PURGE | 13:06 | 12.Mar.09 |
| 20 START OPENING CUSTODY TRANSFER | 13:01 | 12.Mar.09 |
| 21 FINISH OPENING CUSTODY TRANSFER | 13:02 | 12.Mar.09 |
| 22 OPEN BOG VALVE TO SHORE | 13:18 | 12.Mar.09 |

| | | TIME | DATE |
|---|---|---|---|
| BOG COUNTER ( .....KG) | | | |
| 23 START LOADING UTILITIES | | | |
| (HFO, MDO, MGO, FW, STORES) | | | |
| 24 FINISH LOADING UTILITIES | | | |
| (HFO, MDO, MGO, FW, STORES) | | | |
| 25 FINISH OXYGEN TEST | | 13:06 | 12.Mar.09 |
| 26 ESD TRIP TEST (WARM) | START | 13:12 | 12.Mar.09 |
| | FINISH | 13:17 | 12.Mar.09 |
| 27 LIQUID ARM COOLDOWN | START | 13:25 | 12.Mar.09 |
| | FINISH | 14:25 | 12.Mar.09 |
| 28 ESD TRIP TEST (COLD) | START | 14:30 | 12.Mar.09 |
| | FINISH | 14:33 | 12.Mar.09 |
| 29 CARGO TANK PURGE | START | | |
| | FINISH | | |
| 30 CARGO TANK COOLDOWN | START | | |
| | FINISH | | |
| 31 START CARGO TRANSFER | | 14:40 | 12.Mar.09 |
| 32 FULL RATE DISCHARGING / LOADING | | 15:50 | 12.Mar.09 |
| 33 START TRANSFER SLOWDOWN | | 04:19 | 13.Mar.09 |
| 34 FINISH CARGO TRANSFER | | 04:50 | 13.Mar.09 |
| 35 ARM DRAINING | START | 05:00 | 13.Mar.09 |
| | FINISH | 05:27 | 13.Mar.09 |

| | | TIME | DATE |
|---|---|---|---|
| 36 START ARM PURGING | LIQUID | 05:29 | 13.Mar.09 |
| | VAPOR | 06:41 | 13.Mar.09 |
| 37 FINISH ARM PURGING | LIQUID | 06:39 | 13.Mar.09 |
| | VAPOR | 06:51 | 13.Mar.09 |
| 38 CLOSE BOG VALVE TO SHORE | | 06:53 | 13.Mar.09 |
| BOG COUNTER (..... KG) | | | |
| 39 QUANTITY OF BOG SENT TO BOILER: | KG | | |
| 40 CLOSING CUSTODY TRANSFER | START | 05:37 | 13.Mar.09 |
| | FINISH | 05:38 | 13.Mar.09 |
| 41 START ARM DISCONNECTION | VAPOR | 06:55 | 13.Mar.09 |
| | LIQUID | 05:55 | 13.Mar.09 |
| 42 FINISH ARM DISCONNECTION | VAPOR | 06:58 | 13.Mar.09 |
| | LIQUID | 06:44 | 13.Mar.09 |
| 43 FINISH POST - OPERATIONS MEETING | | | |
| 44 PILOT ON BOARD - OUTBOUND | | | |
| 45 DOCUMENTATION CLEARED | | | |
| 46 GANGWAY REMOVED | | | |
| 47 S.B.E. (STAND-BY ENGINE) | | | |
| 48 ALL LINES LET GO | | | |
| 49 TUGS AWAY | | | |
| 50 LET GO ANCHOR - OUTBOUND | | | |
| 51 ANCHOR AWEIGH - OUTBOUND | | | |
| 52 PILOT AWAY | | | |
| 53 DEPARTURE - START OF SEA PASSAGE | | | |

61 INWARD DELAYS

62 BERTH DELAYS

63 OUTWARD DELAYS

64 REMARKS

65 TUGS USED INBOUND

TUGS USED OUTBOUND

| ARRIVAL DRAFT | | | DEPARTURE DRAFT | | |
|---|---|---|---|---|---|
| FWD | 9.20 | METERS | FWD | [illegible] | METERS |
| AFT | 9.20 | METERS | AFT | 11.29 | METERS |
| MID | 9.20 | METERS | MID | 11.29 | METERS |
| MEAN | 9.20 | METERS | MEAN | 11.29 | METERS |

QUANTITY OF LNG

| | | |
|---|---|---|
| OPENING CTM | 104,252 | M³ |
| CLOSING CTM | 143614.392 | M³ |

| | HFO | LSHFO | MDO | MGO | |
|---|---|---|---|---|---|
| ARRIVAL | | | | | MT |
| RECEIVED | | | | | MT |
| DEPARTURE | | | | | MT |
| CONSUMED IN PORT | | | | | MT |

Gas Company Limited — Commercial & Shipping Group — P.O. BOX [illegible] DOHA - QATAR

CPC
BUYER

RASGAS
SELLER (RASGAS)

Capt. Davorin Kristicevic
MASTER

S.S. EJNAN — Peninsula LNG Transport No. 4 Ltd.

13.03.2009.
DATE

COPY

**RasGas Company Limited**

# CARGO MANIFEST

Port of loading : Port of Ras Laffan - LNG Berth No. 3

Grade : Liquefied Natural Gas Lean (LNG Lean)

Vessel : EJNAN

Cargo No : RL2-CPC01-2009-003

Destination : YUNG AN, Taiwan

Consignee : CPC Corporation, Taiwan

Net Quantity : 143,510 Cubic Meters @ -160.8 °C

شركة راس غاز المحدودة
RasGas Company Limited
P.O.Box : 24260
DOHA - QATAR
Commercial Shipping Group

As agent for and on behalf of
Ras Laffan Liquefied Natural Gas Company Ltd (II)

13th March 2009
Date

S. S. EJNAN
Peninsula
LNG Transport
No. 4 Ltd.
NYK LNG Shipmanagement(UK)Ltd.

Master or Agent for Master

دولة قطر
الهيئة العامة للجمارك والموانئ
إدارة الموانئ والجمارك البحرية
Customs Authority
STATE OF QATAR

COPY

**RasGas Company Limited**

# CERTIFICATE OF ORIGIN

Port of loading : Port of Ras Laffan - LNG Berth No. 3

Grade : Liquefied Natural Gas Lean (LNG Lean)

Vessel : EJNAN

Cargo No : RL2-CPC01-2009-003

Destination : YUNG AN, Taiwan

Consignee : CPC Corporation, Taiwan

Net Quantity : 143,510 Cubic Meters @ -160.8 °C

It is hereby certified that the above-mentioned cargo has been exported by
Ras Laffan Liquefied Natural Gas Company Ltd (II)
and is a product of the State of Qatar.

Certified at Ras Laffan this 13th day of March 2009

RasGas Company Limited P.O.Box : 24200 DOHA - QATAR Commercial & Shipping Group

As agent for and on behalf of
Ras Laffan Liquefied Natural Gas Company Ltd (II)

STATE OF QATAR
Customs Authority
Dept. of Ports & Sea Customs

COPY

RasGas Company Limited

# STATEMENT OF COOLING TIME

| | MEMBRANE | |
|---|---|---|
| **VESSEL** : EJNAN | **DATE** | **TIME** |
| **CARGO NO** : RL2-CPC01-2009-003 | | |
| **VOYAGE NO**: EJ009(RG-EJN-024L) | | |
| ARRIVAL (PILOT STATION) | 12-MAR-2009 | 09:58 |
| NOTICE OF READINESS (TENDERED) | 12-MAR-2009 | 11:30 |
| NOTICE OF READINESS (RECEIVED) | 12-MAR-2009 | 11:30 |

| CARGO TANK NO. | TEMPERATURE Deg. C |
|---|---|
| 1 | -137.1 |
| 2 | -130.9 |
| 3 | -132.4 |
| 4 | -131.6 |

S.S. EJNAN Peninsula LNG Transport No. 4 Ltd. NYK LNG Shipmanagement(UK)Ltd.

Master or Agent for Master

P.O.Box : 24280 DOHA - QATAR RasGas Company Limited Commercial & Shipping Group

As agent for and on behalf of
Ras Laffan Liquefied Natural Gas Company Ltd (II)

For Buyer

SGS QATAR 2

Surveyor

13/03/2009
Date

COPY

RasGas Company Limited

# SAMPLE RECEIPT

Vessel : **EJNAN** Cargo_no : **RL2-CPC01-2009-003**

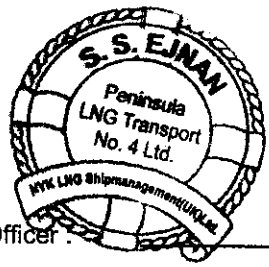
Voyage_no : **EJ009(RG-EJN-024L)**

Loading port : **Port of Ras Laffan - LNG Berth No. 3** Date Loading Completed : **13th March, 2009 - 04:50**

Discharge port : **YUNG AN, Taiwan** ETA Discharge Port : **25th March, 2009 - 00:00**

Description : Sample Bottle - Serial Number **AK 3020**

I hereby acknowledge receipt of the above described sample bottle from Ras Laffan Liquefied Natural Gas Company Ltd (II), which will be delivered to CPC Corporation at the Discharge Port.




Master / Chief Officer :

Date Received : 13th March 2009

COPY

RasGas Company Limited

# MASTER'S RECEIPT OF DOCUMENTS FROM TERMINAL

Port of Loading : Port of Ras Laffan - LNG Berth No. 3

Grade : Liquefied Natural Gas Lean (LNG Lean)

Vessel : EJNAN

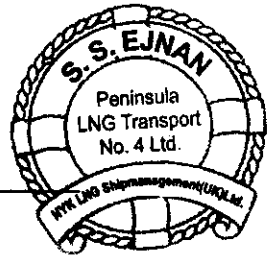
Cargo No. : RL2-CPC01-2009-003

Destination : YUNG AN, Taiwan

Voyage No. : EJ009(RG-EJN-024L)

Consignee : CPC Corporation

| DOCUMENTS | Master | |
|---|---|---|
| | Original | Copy |
| Cargo Manifest | 1 | 1 |
| Certificate of Origin | 1 | 1 |
| Sample Receipt | 1 | 1 |
| Masters Receipt of Documents from Terminal | 1 | 1 |
| Statement of Cooling Time | 1 | 1 |




Master or Agent for Master

13th March 2009

Date

COPY

RasGas Company Limited

# LNG Cargo Analysis Report

Port of Loading : Port of Ras Laffan - LNG Berth No. 3

Vessel : EJNAN

Cargo Number : RL2-CPC01-2009-003 Date Loading Commenced : 12-MAR-2009

Voyage : EJ009(RG-EJN-024L) Date Loading Completed : 13-MAR-2009

Laboratory Report : LAB/LNG/09/CPC0009

| Component | Composition (MOL%) |
|---|---|
| Methane CH4 | 92.97 |
| Ethane C2H6 | 6.16 |
| Propane C3H8 | 0.17 |
| Iso-Butane i-C4H10 | 0.01 |
| Normal Butane n-C4H10 | 0.01 |
| Iso-Pentane i-C5H12 | - |
| Normal Pentane n-C5H12 | - |
| Hexanes Plus C6H14+ | - |
| Nitrogen N2 | 0.68 |
| Oxygen O2 | - |
| Cabon Dioxide CO2 | - |
| Total | 100.00 |

SULFUR CONTENT

| | | |
|---|---|---|
| Total Sulphur | mg/ncm | 0.25 |
| Hydrogen Sulphide | mg/ncm | - |

Note: If the total sulfur content is less than 0.25 grains per 100 Standard Cubic Feet (equiv to 7.9 ppmw or 5.64 mg/ncm), it is not necessary to analyze the sample for H2S

Retained Sample : Cylinder L 59107

Seal No. : I 0495493

Analysis Performed by Seller's Representative
Ras Laffan Liquefied Natural Gas Company Ltd (II)

Witnessed and Verified by Buyer's Representative
(CPC Corporation)

Witnessed and Verified by
SGS

SGS QATAR 2

# LNG Cargo Analysis Report

**Name of Tanker :** EJNAN
**Cargo Number :** RL2-CPC01-2009-003
**Voyage Number :** EJ009 (RG-EJN-024L)

**Date Loading Commenced:** 12-Mar-09
**Date Loading Completed :** 13-Mar-09

**Laboratory Report Number :** LAB/LNG/09/CPC0009

| Component | | Composition (MOL%) |
|---|---|---|
| Methane | CH4 | 92.97 |
| Ethane | C2H6 | 6.16 |
| Propane | C3H8 | 0.17 |
| Iso-Butane | i-C4H10 | 0.01 |
| Normal Butane | n-C4H10 | 0.01 |
| Iso- Pentane | i-C5H12 | 0.00 |
| Normal Pentane | n-C5H12 | 0.00 |
| Hexane Plus | C6H14+ | 0.00 |
| Nitrogen | N2 | 0.68 |
| Oxygen | O2 | 0.00 |
| Carbon Dioxide | CO2 | 0.00 |
| Total | | 100.00 |

**SULFUR CONTENT**

| | | |
|---|---|---|
| Hydrogen Sulfide | $mg/Nm^3$ | - |
| Total Sulfur | $mg/Nm^3$ | 0.25 |

Note: If the Total Sulfur content is not more than 5mg/Nm3, it is not necessary to analyse the sample for H2S

Retained Sample : Cylinder No : **L 59107**
Seal Numbers : **I 0495493**

Analysis Performed by the Seller's Representative
(RasGas) Print Name : for MAHER AL-SAADEH

Witnessed and Verified by Buyer's Representative
(CPC) Print Name : CHENG CHUN LIU

Witnessed and Verified by
(SGS , QATAR) Print Name : RICHARD DIMARLIG

SGS QATAR 2

# Test Report – Composition
## (Quality of LNG Delivered)

| | | |
|---|---|---|
| Report No. | : | LAB/LNG/09/CPC0009 |
| Revision | : | 1 |
| Sample Name | : | LNG FROM BERTH No.3 |
| Cargo No. | : | RL2-CPC01-2009-003 |
| Cylinder No. | : | X22105 |
| Location | : | LNG LOADING LINE |
| Sampling Date | : | 13-Mar-09 |
| Sampling Time | : | 05:10 |
| Sampling Method | : | CONTINUOUS GASIFICATION |
| Sampled By | : | MAHER AL-SAADEH |
| Analysis Method | : | GPA 2261 |
| GC Used | : | VARIAN / SYS-12 / 104448 |
| Analyst | : | MAHER AL-SAADEH |

| Component | Certificate MOL % | Count 1 Peak Area | Count 2 Peak Area | Average Peak Area | Difference % |
|---|---|---|---|---|---|
| Methane | 92.97 | 3509227 | 3513274 | 3511250.5 | 0.12 |
| Ethane | 6.16 | 333544 | 333757 | 333650.5 | 0.06 |
| Propane | 0.17 | 1505024 | 1506374 | 1505699 | 0.09 |
| I-Butane | 0.01 | 80284 | 79076 | 79680 | 1.52 |
| N-Butane | 0.01 | 112766 | 113648 | 113207 | 0.78 |
| I-Pentane | 0.00 | 0 | 0 | 0 | - |
| N-Pentane | 0.00 | 0 | 0 | 0 | - |
| Hexane Plus | 0.00 | 0 | 0 | 0 | - |
| Nitrogen | 0.68 | 29662 | 29768 | 29715 | 0.36 |
| Carbon Dioxide | 0.00 | 0 | 0 | 0 | - |
| Oxygen | 0.00 | 0 | 0 | 0 | - |

. Represents (Count 1 – Count 2) * 100/Average

Data File: c:\star\sys_12 data\maher\std\std013.run

Sample ID: STD

Operator (Inj): MAHER

Injection Notes: 760 mmHg

Injection Date: 03/13/2009 01:49:42 AM

Instrument (Inj): SYS_12

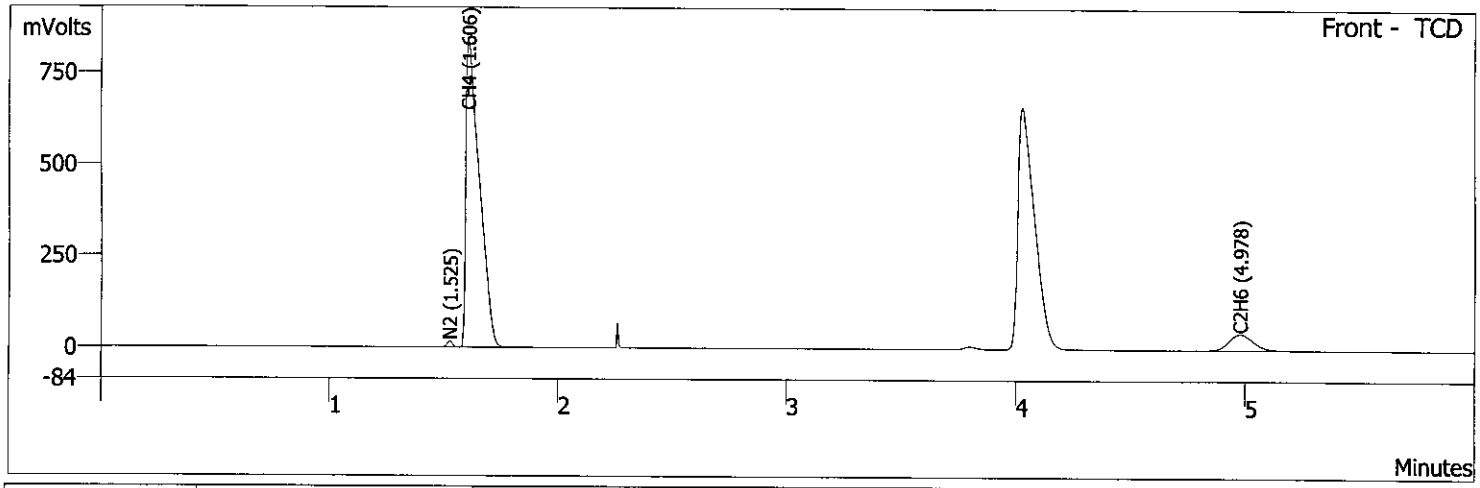
Run Mode: Analysis

Peak Measurement: Peak Area

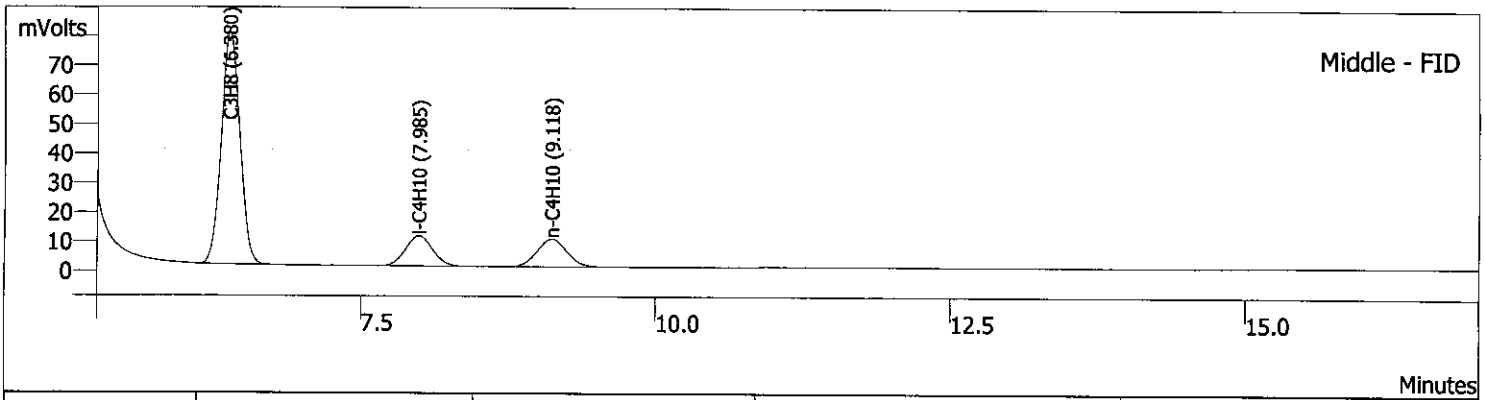
Peak Area External Std.

Injection Method: c:\star\sys_12\mar 09_sys 12.mth

Calculation Method: c:\star\sys_12\mar 09_sys 12.mth




| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | N2 | 1.525 | 26630 | 0.5964 |
| 2 | CH4 | 1.606 | 3532543 | 93.4511 |
| 3 | C2H6 | 4.978 | 326406 | 6.0281 |
| | **Totals** | | **3885579** | **100.0756** |




| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | C3H8 | 6.380 | 870857 | 0.0987 |
| 2 | i-C4H10 | 7.985 | 166395 | 0.0147 |
| 3 | n-C4H10 | 9.118 | 169082 | 0.0147 |
| | **Totals** | | **1206334** | **0.1281** |

Data File: c:\star\sys_12 data\maher\std\std014.run

Sample ID: STD

Operator (Inj): MAHER

Injection Notes: 760 mmHg

Injection Date: 03/13/2009 02:10:02 AM

Instrument (Inj): SYS_12

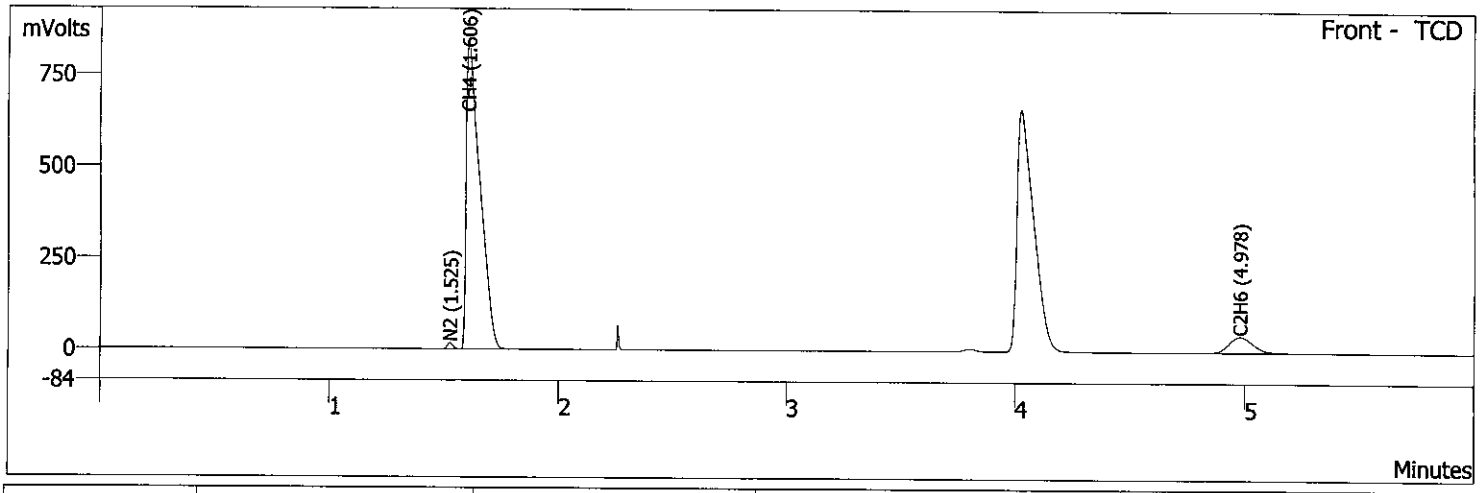
Run Mode: Analysis

Peak Measurement: Peak Area

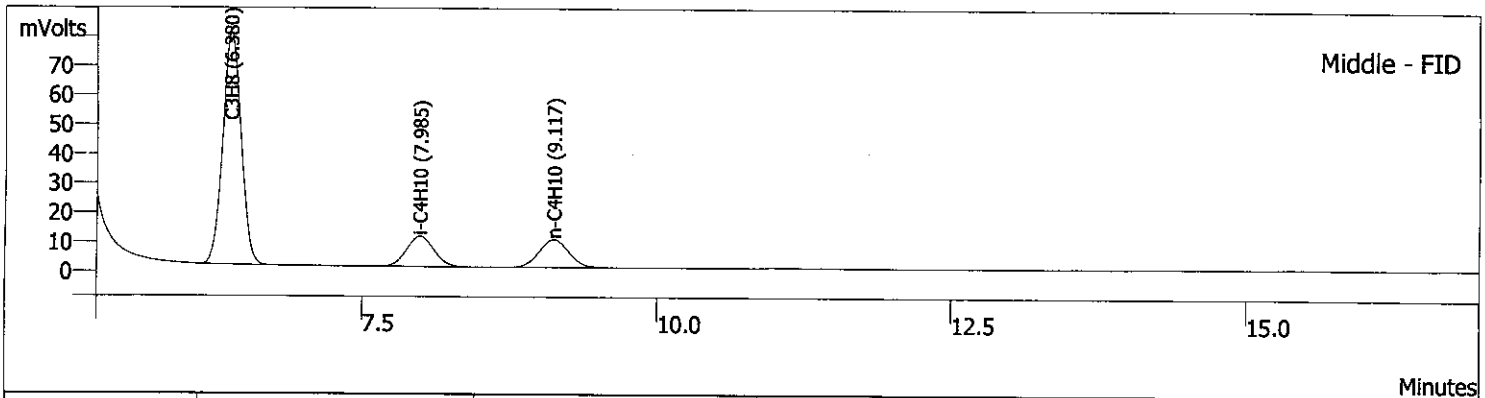
Peak Area External Std.

Injection Method: c:\star\sys_12\mar 09_sys 12.mth

Calculation Method: c:\star\sys_12\mar 09_sys 12.mth




| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | N2 | 1.525 | 26563 | 0.5948 |
| 2 | CH4 | 1.606 | 3532219 | 93.4425 |
| 3 | C2H6 | 4.978 | 326209 | 6.0245 |
| | **Totals** | | **3884991** | **100.0618** |




| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | C3H8 | 6.380 | 869628 | 0.0985 |
| 2 | i-C4H10 | 7.985 | 165716 | 0.0146 |
| 3 | n-C4H10 | 9.117 | 167518 | 0.0146 |
| | **Totals** | | **1202862** | **0.1277** |

Data File: c:\star\sys_12 data\maher\loading\ejnan002.run

Sample ID: EJNAN

Operator (Inj): MAHER

Injection Notes: 760 mmHg

Injection Date: 03/13/2009 06:14:22 AM

Instrument (Inj): SYS_12

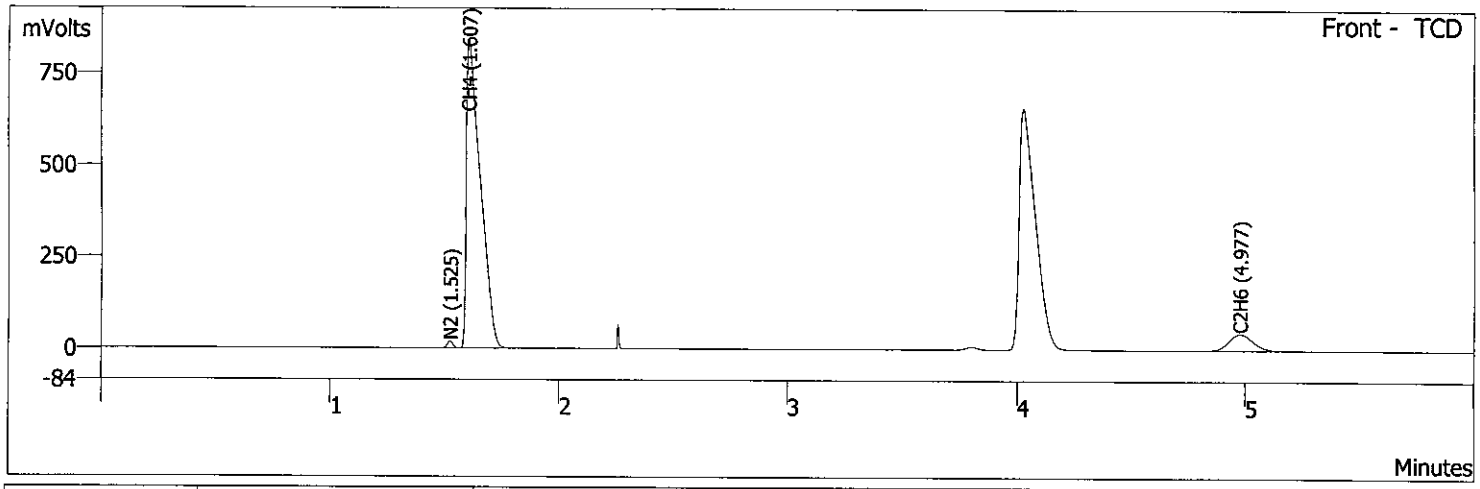
Run Mode: Analysis

Peak Measurement: Peak Area

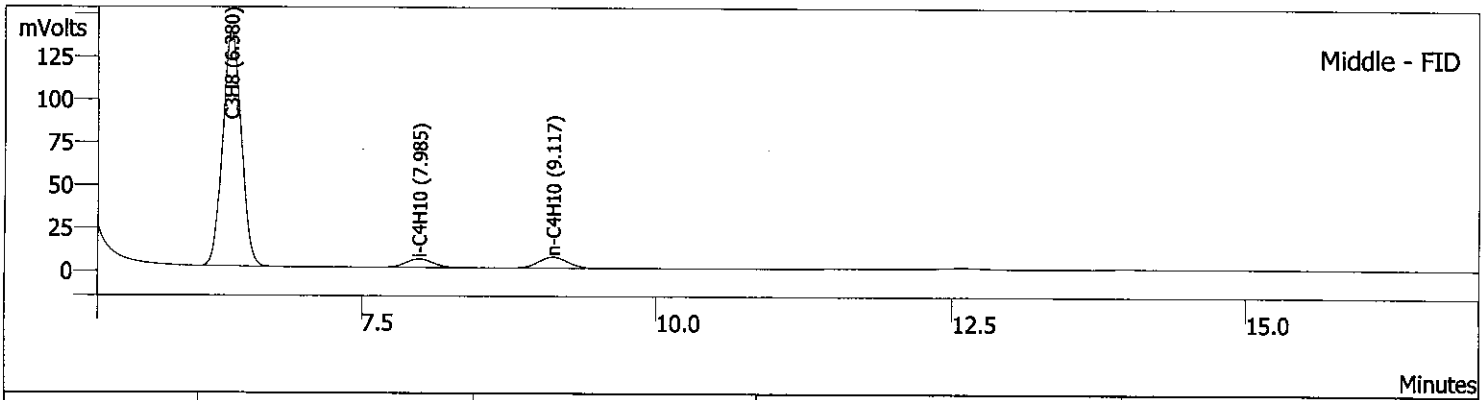
Peak Area External Std.

Injection Method: c:\star\sys_12\mar 09_sys 12.mth

Calculation Method: c:\star\sys_12\mar 09_sys 12.mth




| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | N2 | 1.525 | 29662 | 0.6643 |
| 2 | CH4 | 1.607 | 3509227 | 92.8343 |
| 3 | C2H6 | 4.977 | 333544 | 6.1600 |
| | **Totals** | | **3872433** | **99.6586** |




| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | C3H8 | 6.380 | 1505024 | 0.1705 |
| 2 | i-C4H10 | 7.985 | 80284 | 0.0071 |
| 3 | n-C4H10 | 9.117 | 112766 | 0.0098 |
| | **Totals** | | **1698074** | **0.1874** |

Data File: c:\star\sys_12 data\maher\loading\ejnan003.run

Sample ID: EJNAN

Operator (Inj): MAHER

Injection Notes: 760 mmHg

Injection Date: 03/13/2009 06:34:44 AM

Instrument (Inj): SYS_12

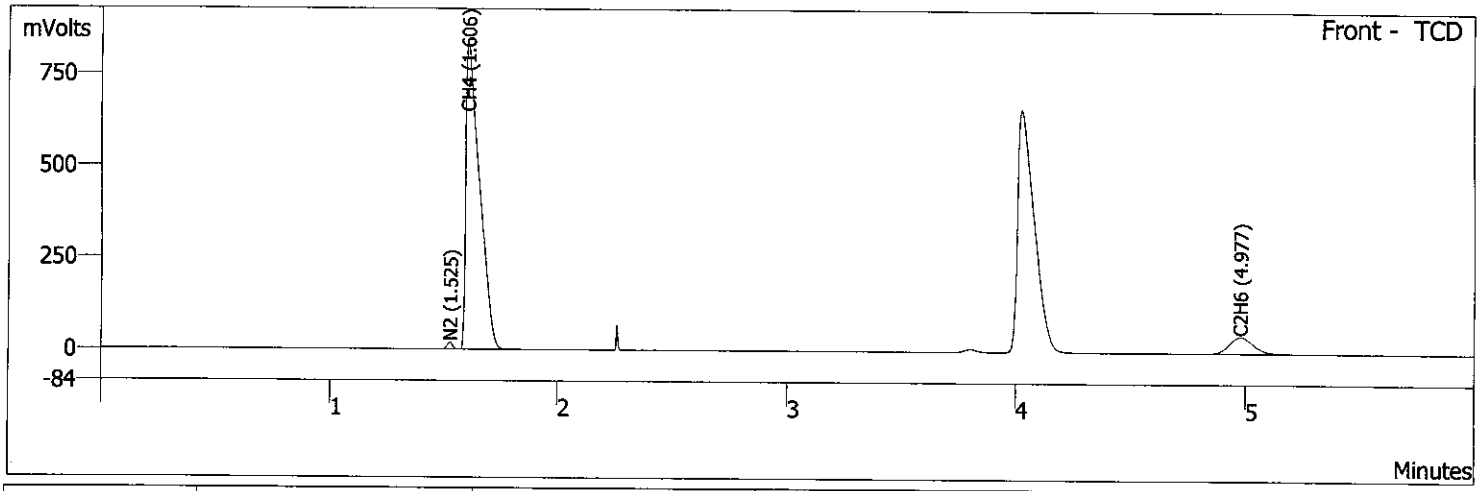
Run Mode: Analysis

Peak Measurement: Peak Area

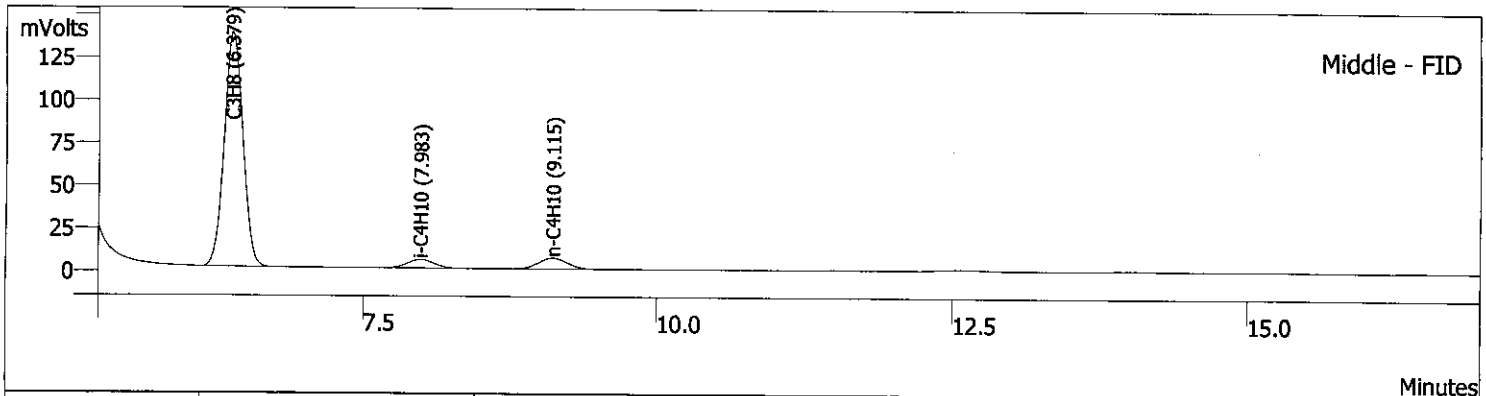
Peak Area External Std.

Injection Method: c:\star\sys_12\mar 09_sys 12.mth

Calculation Method: c:\star\sys_12\mar 09_sys 12.mth



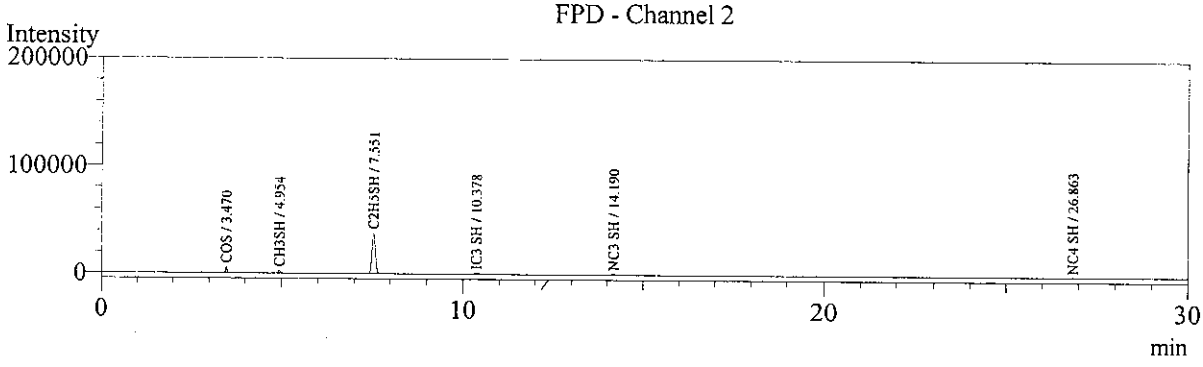

| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | N2 | 1.525 | 29768 | 0.6666 |
| 2 | CH4 | 1.606 | 3513274 | 92.9414 |
| 3 | C2H6 | 4.977 | 333757 | 6.1639 |
| | **Totals** | | **3876799** | **99.7719** |



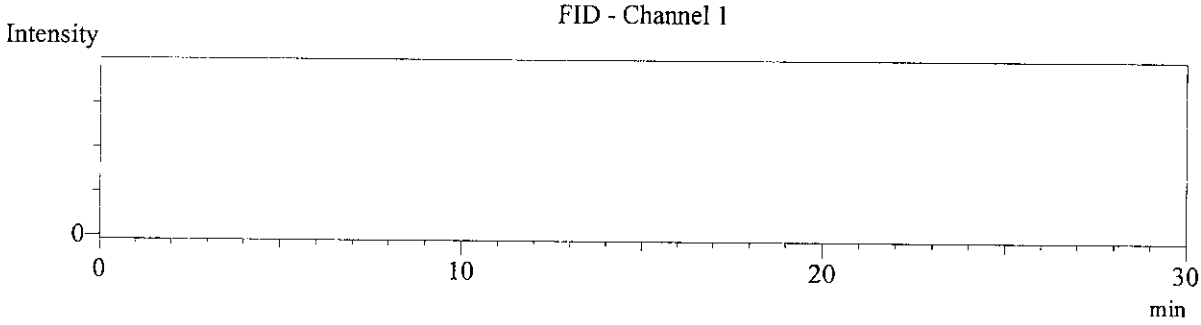

| Peak No | Peak Name | Ret. Time (min) | Area (counts) | Result ( mole %) |
|---|---|---|---|---|
| 1 | C3H8 | 6.379 | 1506374 | 0.1707 |
| 2 | i-C4H10 | 7.983 | 79076 | 0.0070 |
| 3 | n-C4H10 | 9.115 | 113648 | 0.0099 |
| | **Totals** | | **1699098** | **0.1876** |

| | |
|---|---|
| Analysis Date & Time | : 3/13/2009 1:04:28 AM |
| User Name | : Maher Al-Saadeh |
| Sample Name | : RSH STD |
| Sample ID | : |
| Sample Type | : Unknown |
| Data Name | : C:\GCsolution\Data\Maher\RSH STD2.gcd |
| Method Name | : C:\GCsolution\Data\METHOD\Master Sulfur.gcm |

FPD - Channel 2

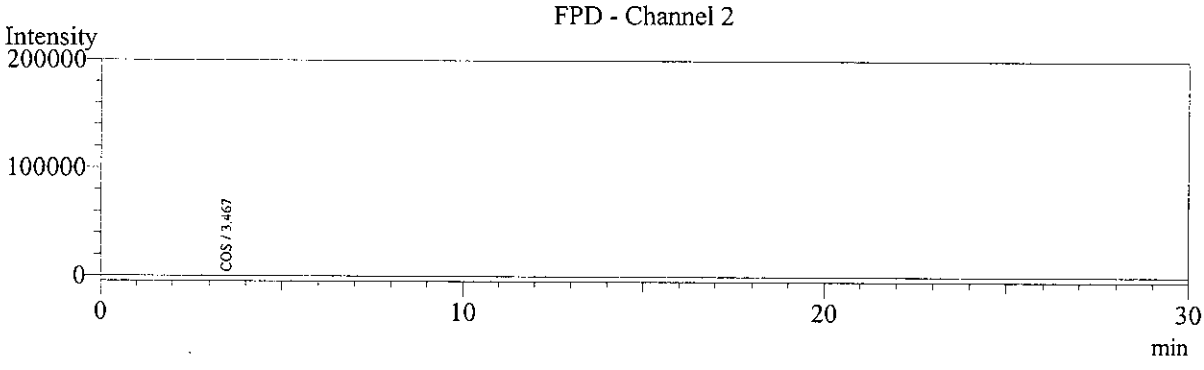


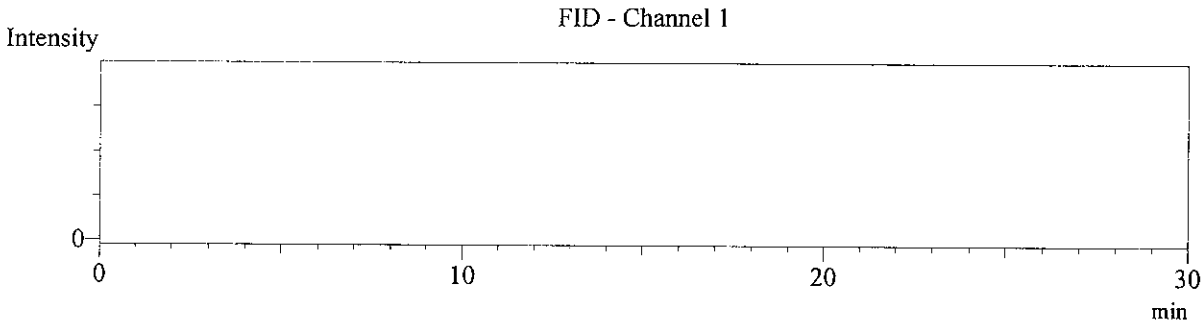

FID - Channel 1




| Peak# | Ret.Time | Area | Conc. | Unit | Cmpd Name |
|---|---|---|---|---|---|
| 1 | 3.470 | 13789 | 8.92 | ppmv | COS |
| 2 | 4.954 | 9401 | 9.43 | ppmv | CH3SH |
| 3 | 7.551 | 249952 | 62.81 | ppmv | C2H5SH |
| 4 | 10.378 | 9403 | 13.87 | ppmv | IC3 SH |
| 5 | 14.190 | 7431 | 13.64 | ppmv | NC3 SH |
| 6 | 26.863 | 1978 | 9.47 | ppmv | NC4 SH |
| Total | | 291954 | 118.14 | | |

| | |
|---|---|
| Analysis Date & Time | : 3/13/2009 5:43:42 AM |
| User Name | : Maher Al-Saadeh |
| Sample Name | : EJNAN |
| Sample ID | : |
| Sample Type | : Unknown |
| Data Name | : C:\GCsolution\Data\Maher\EJNAN.gcd |
| Method Name | : C:\GCsolution\Data\METHOD\Master Sulfur.gcm |




| Peak# | Ret.Time | Area | Conc. | Unit | Cmpd Name |
|---|---|---|---|---|---|
| 1 | 3.467 | 4 | 0.19 | ppmv | COS |
| Total | | 4 | 0.19 | | |

Total Sulfur = 0.25 mg/ncm .

UPDATE YELLOW SHADED CELLS

## CORRELATION SHEET FOR LNG CERTIFICATION

| SAMPLE | REFERENCE STANDARD GAS | LNG / EJNAN |
|---|---|---|
| CYLINDER No. | 7700983 | X22105 |
| CARGO No. | NOT APPLICABLE | RL2-CPC01-2009-003 |
| LOCATION | RAS GAS LAB. | RAS GAS LAB. |
| GC / Serial No. | VARIAN / SYS -12 / 104448 | VARIAN / SYS-12 / 104448 |
| SAMPLING METHOD | NOT APPLICABLE | CONTINUOUS GASIFICATION |
| DATE CERTIFIED | 29-Sep-08 | 13-Mar-09 |
| SAMPLING TIME | NOT APPLICABLE | 05:10 |
| SAMPLED BY | SCOTT SPECIALTY GASES | MAHER AL-SAADEH |
| ANALYSIS DATE | 13-Mar-09 | 13-Mar-09 |
| ANALYST | MAHER AL-SAADEH | MAHER AL-SAADEH |
| ANALYSIS METHOD | GC, GPA 2261 | GC, GPA 2261 |

| COMPONENT | CERTIFICATE MOL% | COUNT 1 | | | COUNT 2 | | | DIFF | AVERAGE | COUNT 1 | | | COUNT 2 | | | DIFF | TEST RESULT (MOL%) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SAMPLE PRESSURE | PEAK AREA | RESPONSE FACTOR | SAMPLE PRESSURE | PEAK AREA | RESPONSE FACTOR | RESPONSE FACTOR | RESPONSE FACTOR | SAMPLE PRESSURE | PEAK AREA | MOL% | SAMPLE PRESSURE | PEAK AREA | MOL% | MOL% | UNORMALIZED | REPORTED VALUE |
| | A | B(mmHg) | C | D=A*B/C | E(mmHg) | F | G=A*E/F | H=(D-G)*100/I | I=(D+G)/2 | J | K | L=I*K/J | M | N | O=I*N/M | P=(L-O)*100/Q | Q=(L+O)/2 | |
| O2 | 0.0000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000000000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000 | 0.00 |
| N2 | 0.6030 | 760 | 26630 | 0.017209163 | 760 | 26563 | 0.017252569 | 0.25 | 0.017230866 | 760 | 29662 | 0.673000000 | 760 | 29768 | 0.675000000 | 0.30 | 0.674 | 0.68 |
| CH4 | 93.3600 | 760 | 3532543 | 0.020085700 | 760 | 3532219 | 0.020087543 | 0.01 | 0.020086622 | 760 | 3509227 | 92.748000000 | 760 | 3513274 | 92.855000000 | 0.12 | 92.802 | 92.97 |
| CO2 | 0.0000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000000000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000 | 0.00 |
| C2H6 | 6.0130 | 760 | 326406 | 0.014000600 | 760 | 326209 | 0.014009056 | 0.06 | 0.014004828 | 760 | 333544 | 6.146000000 | 760 | 333757 | 6.150000000 | 0.07 | 6.148 | 6.16 |
| C6H14+ | 0.0000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000000000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000 | 0.00 |
| C3H8 | 0.1007 | 760 | 870857 | 0.000087881 | 760 | 869628 | 0.000088005 | 0.14 | 0.000087943 | 760 | 1505024 | 0.174000000 | 760 | 1506374 | 0.174000000 | 0.00 | 0.174 | 0.17 |
| I-C4H10 | 0.01497 | 760 | 166395 | 0.000068375 | 760 | 165716 | 0.000068655 | 0.41 | 0.000068515 | 760 | 80284 | 0.007000000 | 760 | 79076 | 0.007000000 | 0.00 | 0.007 | 0.01 |
| N-C4H10 | 0.0150 | 760 | 169082 | 0.000067423 | 760 | 167518 | 0.000068052 | 0.93 | 0.000067738 | 760 | 112766 | 0.010000000 | 760 | 113648 | 0.010000000 | 0.00 | 0.010 | 0.01 |
| I-C5H12 | 0.0000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000000000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000 | 0.00 |
| N-C5H12 | 0.0000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000000000 | 760 | 0 | 0.000000000 | 760 | 0 | 0.000000000 | - | 0.000 | 0.00 |
| TOTAL | 100.1067 | | 5091913 | | | 5087853 | | | | | 5570507 | 99.758 | | 5575897 | 99.871 | | 99.815 | 100.00 |
| | | | | | | | | | | | | | | | | | | |

# Calculation of BTU Quantity of LNG Delivered
## (Loading Port)

| | | | |
|---|---|---|---|
| Ship's Name | EJNAN | Cargo No | RL2-CPC01-2009-003 |
| Date of Loading Completion | 13-Mar-2009 | Voyage No | EJ009(RG-EJN-024L) |

| Component | Molar Fraction (Xi) | Mol-Weight Kg/Kmol (Mi) | M-Fraction Weight (Xi*Mi) | Molar Volume (Vi) | M-Fraction Volume (Xi*Vi) | AA = (Xi*Mi/A) | GHV Mass Hi*AA | GHV Volume (Hv) |
|---|---|---|---|---|---|---|---|---|
| CH4 | 92.97% | 16.042 | 14.914 | 0.038042 | 0.035368 | 0.87508 | 46,093 | 939.0 |
| C2H6 | 6.16% | 30.069 | 1.852 | 0.047872 | 0.002949 | 0.10867 | 5,351 | 109.0 |
| C3H8 | 0.17% | 44.096 | 0.075 | 0.062428 | 0.000106 | 0.00440 | 210 | 4.3 |
| i-C4H10 | 0.01% | 58.122 | 0.006 | 0.078270 | 0.000008 | 0.00035 | 16 | 0.3 |
| n-C4H10 | 0.01% | 58.122 | 0.006 | 0.076800 | 0.000008 | 0.00035 | 16 | 0.3 |
| i-C5H12 | 0.00% | 72.149 | 0.000 | 0.091632 | 0.000000 | 0.00000 | 0 | 0.0 |
| n-C5H12 | 0.00% | 72.149 | 0.000 | 0.091496 | 0.000000 | 0.00000 | 0 | 0.0 |
| C6H14+ | 0.00% | 86.175 | 0.000 | 0.104812 | 0.000000 | 0.00000 | 0 | 0.0 |
| N2 | 0.68% | 28.013 | 0.190 | 0.046480 | 0.000316 | 0.01115 | 0 | 0.0 |
| O2 | 0.00% | 31.999 | 0.000 | 0.000000 | 0.000000 | 0.00000 | 0 | 0.0 |
| CO2 | 0.00% | 44.096 | 0.000 | 0.027120 | 0.000000 | 0.00000 | 0 | 0.0 |
| | 100.00% | A = | 17.043 | B = | 0.038755 | P = | 51,686 | 1,053 |

| | | | | | |
|---|---|---|---|---|---|
| Xm = | 92.97% | | TL(°C) = | -160.8 | Quality (BTU/SCF) OK |
| Xn = | 0.68% | | K1 = | 0.000213 | 1,050 < Q < 1,170 |
| Xm*C = | 0.000222 | | K2 = | 0.000375 | |
| Density (D)-(Kg/CBM) = | 442.3 | C = [K1 + ((K2-K1)*Xn/0.0425)] = | | 0.000239 | GHV (P)-(Btu/Kg) 51,686 |

| | | |
|---|---|---|
| Volume Loaded (V) | 143,510 | CBM |
| Weight Loaded | 63,474.473 | MT |
| BTU Quantity of LNG Delivered Q(D) | 3,280,740 | MMBTU |
| **Adjusted BTU Quantity of LNG Delivered** | **3,197,080** | **MMBTU** |

### Calculation of Constant "K1", "K2"

| | |
|---|---|
| "A" = | 17.043 |
| "TL" = | -160.8 |

| Range | K1 | K2 |
|---|---|---|
| 17.0 | 0.000204 | 0.000363 |
| 17.4 | 0.000282 | 0.000478 |
| 17.8 | 0.000360 | 0.000593 |

** Remarks:
Density = Sum(Xi*Mi) / {Sum(Xi*Vi)-Xm*C}
K1 & K2 = Obtained by linear interpolation of the data set forth in Table 3 & Table 4 respectively
Q(D) = V*D*P (Rounded to nearest ten (10) million BTU's)
Q(AD) = Q(L)-TA (Rounded to nearest ten (10) million BTU's)
Q(L) = V*D*P (No Rounding)
TA = V*D*P*0.0255 (No Rounding)

Seller:

Surveyor:

SGS QATAR 2