

EXTENDED NATURAL GAS ANALYSIS (*DHA)

MAIN PAGE

LEASE #: NAME/DESCRIP : **ARIKAREE CREEK, MARY JANE 8-5 SPERGEN FORMATION**

PROJECT NO. : **201611156** ANALYSIS NO. : **02**
 COMPANY NAME : **NIGHTHAWK PRODUCTION COMPANY** ANALYSIS DATE: **DECEMBER 01, 2016 14:57**
 OFFICE / BRANCH: **HIGHLANDS RANCH, CO** SAMPLE DATE : **NOVEMBER 29, 2016**
 CUSTOMER REF: TO:
 PRODUCER : EFFECTIVE DATE:

*****FIELD DATA*****

SAMPLE CYCLE: SAMPLE TYPE: **SPOT**
 SAMPLE PRES. : 24.5 psig CYLINDER NO. : **1060**
 LAB PRES: psig SAMPLED BY : **JOHN MOSER**
 SAMPLE TEMP. : 53.3 °f SAMPLING COMPANY: **EMPACT**
 AMBIENT TEMP.: °f H2S BY STAIN TUBE: **7** ppm
 H2O BY STAIN TUBE: #/mmcf CO2 BY STAIN TUBE: **-** Mol %
 FIELD COMMENTS: **NO PROBE; H2S SAMPLED 1-1-17 15:55**
 LAB COMMENTS: **TRACE OLEFINS**

<u>COMPONENT</u>	<u>MOLE %</u>	<u>MASS %</u>	<u>GPM @ 14.730</u>	<u>GPM @ 14.650</u>
ALCOHOLS	0.0026	0.0049		
HELIUM	1.20	0.15	---	---
HYDROGEN	0.05	0.00	---	---
OXYGEN/ARGON	0.32	0.33	---	---
NITROGEN	55.1300	49.3300	---	---
CARBON DIOXIDE	1.72	2.42	---	---
METHANE	18.13320	9.29310	---	---
ETHANE	5.2406	5.0338	1.4050	1.3974
PROPANE	8.2215	11.5810	2.2703	2.2580
I-BUTANE	1.3036	2.4204	0.4271	0.4248
N-BUTANE	4.5258	8.4031	1.4301	1.4224
I-PENTANE	0.9835	2.2638	0.3578	0.3558
N-PENTANE	1.3274	3.0594	0.4814	0.4788
HEXANES PLUS	1.8418	5.7105	0.7963	0.7929
TOTALS	100.00000	100.00000	7.1680	7.1301

<u>BTEX COMPONENTS</u>	<u>MOLE%</u>	<u>WT%</u>	<u>BTU @ 14.730</u>	<u>14.650</u>	
BENZENE	0.0216	0.0539	LOW NET DRY REAL :	794.1 /scf	789.7 /scf
TOLUENE	0.0093	0.0274	NET WET REAL :	780.3 /scf	775.9 /scf
ETHYLBENZENE	0.0014	0.0048	HIGH GROSS DRY REAL :	865.4 /scf	860.7 /scf
XYLENES	0.0105	0.0356	GROSS WET REAL :	850.4 /scf	845.7 /scf
TOTAL BTEX	0.0428	0.1217	NET DRY REAL :	9651.0 /lb	9598.6 /lb
			GROSS DRY REAL :	10521.1 /lb	10464.0 /lb

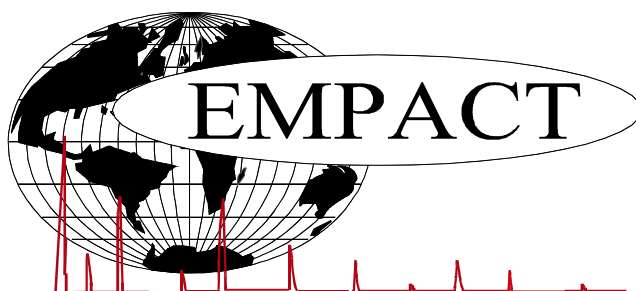
(CALC: GPA STD 2145 & TP-17 @14.696 & 60 F)

*(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730

RELATIVE DENSITY (AIR=1): 1.0794

COMPRESSIBILITY FACTOR : 0.99732

The data presented herein has been acquired by means of current analytical techniques and represents the judicious conclusion EMPACT Analytical Systems, Inc. Results of the analysis can be affected by the sampling conditions, therefore, are only warranted through proper lab protocol. EMPACT assumes no responsibility for interpretation or any consequences from application of the reported information and is the sole liability of the user. The reproduction in any media of this reported information may not be made, in portion or as a whole, without the written permission of EMPACT Analytical Systems, Inc.



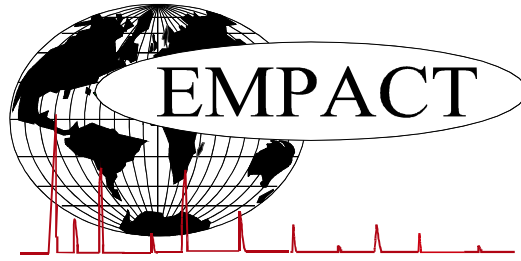
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GLYCALC INFORMATION

PROJECT NO. :	201611156	ANALYSIS NO. :	02
COMPANY NAME :	NIGHTHAWK PRODUCTION COMPANY	ANALYSIS DATE:	DECEMBER 01, 2016 14:57
ACCOUNT NO. :		SAMPLE DATE :	NOVEMBER 29, 2016
PRODUCER :		CYLINDER NO. :	1060
LEASE NO. :		SAMPLED BY :	JOHN MOSER
NAME/DESCRIP :	ARIKAREE CREEK, MARY JANE 8-5 SPERGEN FORMATION		
FIELD DATA		SAMPLE TEMP. :	53.3
SAMPLE PRES. :	24.5	AMBIENT TEMP.:	
COMMENTS :	NO PROBE; H2S SAMPLED 1-1-17 15:55 TRACE OLEFINS SPOT		

<u>Componet</u>	<u>Mole %</u>	<u>Wt %</u>
Helium	1.20	0.15
Hydrogen	0.05	0.00
Carbon Dioxide	1.72	2.42
Nitrogen	55.13	49.33
Methane	18.13320	9.29310
Ethane	5.2406	5.0338
Propane	8.2215	11.5810
Isobutane	1.3036	2.4204
n-Butane	4.5258	8.4031
Isopentane	0.9374	2.1605
n-Pentane	1.3274	3.0594
Cyclopentane	0.0461	0.1033
n-Hexane	0.3758	1.0345
Cyclohexane	0.0958	0.2576
Other Hexanes	0.5382	1.4729
Heptanes	0.3094	0.9852
Methycyclohexane	0.1009	0.3165
2,2,4 Trimethylpentane	0.0002	0.0007
Benzene	0.0216	0.0539
Toluene	0.0093	0.0274
Ethylbenzene	0.0014	0.0048
Xylenes	0.0105	0.0356
C8+ Heavies	0.3787	1.5214
<u>Subtotal</u>	<u>99.67740</u>	<u>99.66510</u>
Oxygen/Argon	0.32	0.33
<u>Alcohols</u>	<u>0.0026</u>	<u>0.0049</u>
Total	100.00000	100.00000

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DHA COMPONENT LIST

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SAMPLE PRES. :	24.5	AMBIENT TEMP.:	
COMMENTS :	NO PROBE; H2S SAMPLED 1-1-17 15:55 TRACE OLEFINS SPOT		

COMPONENT	PIANO #	MOLE %	MASS %	GPM @ 14.730	GPM @ 14.650
Helium	---	1.20	0.15	---	---
Hydrogen	---	0.05	0.00	---	---
Oxygen/Argon	---	0.32	0.33	---	---
Nitrogen	---	55.13	49.33	---	---
Carbon Dioxide	---	1.72	2.42	---	---
Methane	P1	18.13320	9.29310	---	---
Ethane	P2	5.2406	5.0338	1.405	1.397
Propane	P3	8.2215	11.5810	2.270	2.258
i-Butane	I4	1.3036	2.4204	0.427	0.425
n-Butane	P4	4.5257	8.4029	1.430	1.422
2,2-Dimethylpropane	I5	0.0074	0.0171	0.003	0.003
i-Pentane	I5	0.9300	2.1434	0.341	0.339
Acetone	X3	0.0023	0.0043	0.001	0.001
i-Propanol	X3	0.0003	0.0006	0.000	0.000
UnknownC4s	U4	0.0001	0.0002	0.000	0.000
n-Pentane	P5	1.3245	3.0527	0.481	0.479
2,2-Dimethylbutane	I6	0.0071	0.0196	0.003	0.003
Cyclopentane	N5	0.0461	0.1033	0.014	0.014
2,3-Dimethylbutane	I6	0.0276	0.0760	0.011	0.011
2-Methylpentane	I6	0.2399	0.6604	0.100	0.099
3-Methylpentane	I6	0.1239	0.3411	0.050	0.050
UnknownC5s	U5	0.0029	0.0067	0.001	0.001
n-Hexane	P6	0.3758	1.0345	0.155	0.154
2,2-Dimethylpentane	I7	0.0046	0.0147	0.002	0.002
Methylcyclopentane	N6	0.1372	0.3689	0.048	0.048
2,4-Dimethylpentane	I7	0.0102	0.0327	0.005	0.005
2,2,3-Trimethylbutane	I7	0.0006	0.0019	0.000	0.000
Benzene	A6	0.0216	0.0539	0.006	0.006
3,3-Dimethylpentane	I7	0.0007	0.0022	0.000	0.000
Cyclohexane	N6	0.0958	0.2576	0.033	0.033
2-Methylhexane	I7	0.0405	0.1296	0.019	0.019
2,3-Dimethylpentane	I7	0.0093	0.0298	0.004	0.004
1,1-Dimethylcyclopentane	N7	0.0090	0.0282	0.004	0.004
3-Methylhexane	I7	0.0473	0.1514	0.022	0.022
1c,3-Dimethylcyclopentane	N7	0.0162	0.0508	0.007	0.007
1t,3-Dimethylcyclopentane	N7	0.0185	0.0580	0.009	0.009

3-Ethylpentane	I7	0.0033	0.0106	0.001	0.001
1t,2-Dimethylcyclopentane	N7	0.0262	0.0822	0.012	0.012
2,2,4-Trimethylpentane	I8	0.0002	0.0007	0.000	0.000
UnknownC6s	U6	0.0025	0.0069	0.001	0.001
n-Heptane	P7	0.1121	0.3588	0.052	0.052
1c,2-Dimethylcyclopentane	N7	0.0033	0.0104	0.002	0.002
Methylcyclohexane	N7	0.1009	0.3165	0.040	0.040
2,2-Dimethylhexane	I8	0.0100	0.0365	0.005	0.005
Ethylcyclopentane	N7	0.0054	0.0169	0.002	0.002
2,5-Dimethylhexane	I8	0.0023	0.0084	0.001	0.001
2,2,3-Trimethylpentane	I8	0.0005	0.0018	0.000	0.000
2,4-Dimethylhexane	I8	0.0041	0.0150	0.002	0.002
1c,2t,4-Trimethylcyclopentane	N8	0.0072	0.0258	0.003	0.003
3,3-Dimethylhexane	I8	0.0009	0.0033	0.000	0.000
1t,2c,4-Trimethylcyclopentane	N8	0.0084	0.0301	0.004	0.004
2,3,4-Trimethylpentane	I8	0.0003	0.0011	0.000	0.000
2,3,3-Trimethylpentane	I8	0.0001	0.0004	0.000	0.000
Toluene	A7	0.0093	0.0274	0.003	0.003
2,3-Dimethylhexane	I8	0.0040	0.0146	0.002	0.002
2-Methyl-3-ethylpentane	I8	0.0009	0.0033	0.000	0.000
1,1,2-Trimethylcyclopentane	N8	0.0001	0.0004	0.000	0.000
2-Methylheptane	I8	0.0253	0.0923	0.013	0.013
4-Methylheptane	I8	0.0069	0.0252	0.004	0.004
3-Methyl-3-ethylpentane	I8	0.0012	0.0044	0.001	0.001
3,4-Dimethylhexane	I8	0.0011	0.0040	0.001	0.001
1c,2c,4-Trimethylcyclopentane	N8	0.0007	0.0025	0.000	0.000
1c,3-Dimethylcyclohexane	N8	0.0004	0.0014	0.000	0.000
3-Methylheptane	I8	0.0135	0.0493	0.007	0.007
1c,2t,3-Trimethylcyclopentane	N8	0.0177	0.0634	0.009	0.009
3-Ethylhexane	I8	0.0020	0.0073	0.001	0.001
1t,4-Dimethylcyclohexane	N8	0.0061	0.0219	0.003	0.003
1,1-Dimethylcyclohexane	N8	0.0018	0.0065	0.001	0.001
3c-Ethylmethylcyclopentane	N8	0.0002	0.0007	0.000	0.000
3t-Ethylmethylcyclopentane	N8	0.0016	0.0058	0.001	0.001
2t-Ethylmethylcyclopentane	N8	0.0013	0.0047	0.001	0.001
1,1-Methylethylcyclopentane	N8	0.0031	0.0111	0.002	0.002
2,2,4-Trimethylhexane	I9	0.0004	0.0016	0.000	0.000
1t,2-Dimethylcyclohexane	N8	0.0067	0.0240	0.003	0.003
UnknownC7s	U7	0.0022	0.0070	0.001	0.001
n-Octane	P8	0.0462	0.1686	0.024	0.024
1c,4-Dimethylcyclohexane	N8	0.0023	0.0082	0.001	0.001
i-Propylcyclopentane	I8	0.0008	0.0029	0.000	0.000
2,4,4-Trimethylhexane	I9	0.0003	0.0012	0.000	0.000
2,3,5-Trimethylhexane	I9	0.0008	0.0033	0.000	0.000
2,2,3,4-Tetramethylpentane	I9	0.0005	0.0020	0.000	0.000
2,3,4-Trimethylhexane	I9	0.0005	0.0020	0.000	0.000
1c,2-Dimethylcyclohexane	N8	0.0029	0.0104	0.001	0.001
2,2-Dimethylheptane	I9	0.0002	0.0008	0.000	0.000
1,1,4-Trimethylcyclohexane	N9	0.0095	0.0383	0.005	0.005
2,2,3-Trimethylhexane	I9	0.0060	0.0246	0.003	0.003
2,4-Dimethylheptane	I9	0.0005	0.0020	0.000	0.000
4,4-Dimethylheptane	I9	0.0004	0.0016	0.000	0.000
Ethylcyclohexane	N8	0.0043	0.0154	0.002	0.002
n-Propylcyclopentane	N8	0.0040	0.0143	0.002	0.002
1c,3c,5-Trimethylcyclohexane	N9	0.0006	0.0024	0.000	0.000
2,5-Dimethylheptane	I9	0.0005	0.0020	0.000	0.000
3,3-Dimethylheptane	I9	0.0007	0.0029	0.000	0.000
3,5-Dimethylheptane	I9	0.0004	0.0016	0.000	0.000
2,6-Dimethylheptane	I9	0.0005	0.0020	0.000	0.000

1,1,3-Trimethylcyclohexane	N9	0.0016	0.0065	0.001	0.001
Ethylbenzene	I8	0.0014	0.0048	0.001	0.001
1c,2t,4t-Trimethylcyclohexane	N9	0.0028	0.0113	0.002	0.002
2,3-Dimethylheptane	I9	0.0003	0.0012	0.000	0.000
1,3-Dimethylbenzene (m-Xylene)	A8	0.0067	0.0227	0.003	0.003
1,4-Dimethylbenzene (p-Xylene)	A8	0.0013	0.0044	0.001	0.001
3,4-Dimethylheptane (2)	I9	0.0012	0.0049	0.001	0.001
4-Methyloctane	I9	0.0040	0.0164	0.002	0.002
2-Methyloctane	I9	0.0048	0.0197	0.003	0.003
1c,2t,3-Trimethylcyclohexane	N9	0.0004	0.0016	0.000	0.000
3-Ethylheptane	I9	0.0018	0.0074	0.001	0.001
3-Methyloctane	I9	0.0073	0.0299	0.004	0.004
1c,2t,4c-Trimethylcyclohexane	I9	0.0003	0.0012	0.000	0.000
1,1,2-Trimethylcyclohexane	N9	0.0003	0.0012	0.000	0.000
3,3-Diethylpentane	I9	0.0005	0.0020	0.000	0.000
1,2-Dimethylbenzene (o-Xylene)	A8	0.0025	0.0085	0.001	0.001
i-Butylcyclopentane	N9	0.0031	0.0125	0.002	0.002
UnknownC8s	U8	0.0010	0.0036	0.001	0.001
n-Nonane	P9	0.0226	0.0926	0.013	0.013
1,1-Methylethylcyclohexane	N9	0.0021	0.0085	0.001	0.001
i-Propylbenzene	A9	0.0017	0.0065	0.001	0.001
i-Propylcyclohexane	N9	0.0009	0.0036	0.001	0.001
2,2-Dimethyloctane	I10	0.0005	0.0023	0.000	0.000
2,4-Dimethyloctane	I10	0.0008	0.0036	0.000	0.000
2,6-Dimethyloctane	I10	0.0002	0.0009	0.000	0.000
2,5-Dimethyloctane	I10	0.0004	0.0018	0.000	0.000
n-Butylcyclopentane	N9	0.0029	0.0117	0.002	0.002
3,3-Dimethyloctane	I10	0.0007	0.0032	0.000	0.000
n-Propylbenzene	A9	0.0013	0.0050	0.001	0.001
3,6-Dimethyloctane	I10	0.0012	0.0055	0.001	0.001
3-Methyl-5-ethylheptane	I10	0.0004	0.0018	0.000	0.000
1,3,5-Trimethylbenzene	A9	0.0003	0.0012	0.000	0.000
2,3-Dimethyloctane	I10	0.0019	0.0086	0.001	0.001
5-Methylnonane	I10	0.0007	0.0032	0.000	0.000
1,2-Methylethylbenzene	A9	0.0006	0.0023	0.000	0.000
2-Methylnonane	I10	0.0005	0.0023	0.000	0.000
3-Ethylheptane	I10	0.0008	0.0036	0.000	0.000
3-Methylnonane	I10	0.0020	0.0091	0.001	0.001
1,2,4-Trimethylbenzene	A9	0.0001	0.0004	0.000	0.000
t-Butylbenzene	A10	0.0026	0.0112	0.001	0.001
i-Butylcyclohexane	N10	0.0011	0.0049	0.001	0.001
1t-Methyl-2-n-propylcyclohexane	I10	0.0002	0.0009	0.000	0.000
i-Butylbenzene	A10	0.0003	0.0013	0.000	0.000
sec-Butylbenzene	A10	0.0004	0.0017	0.000	0.000
UnknownC9s	U9	0.0081	0.0332	0.005	0.005
n-Decane	P10	0.0109	0.0495	0.007	0.007
1,2,3-Trimethylbenzene	A9	0.0002	0.0008	0.000	0.000
1,3-Methyl-i-propylbenzene	A10	0.0014	0.0060	0.001	0.001
1,4-Methyl-i-propylbenzene	A10	0.0010	0.0043	0.001	0.001
Sec-Butylcyclohexane	A10	0.0006	0.0027	0.000	0.000
1,2-Methyl-i-propylbenzene	A10	0.0002	0.0009	0.000	0.000
1,3-Methyl-n-propylbenzene	A10	0.0029	0.0124	0.002	0.002
1,4-Diethylbenzene	A10	0.0015	0.0064	0.001	0.001
1,4-Methyl-n-propylbenzene	A10	0.0003	0.0013	0.000	0.000
n-Butylbenzene	A10	0.0006	0.0026	0.000	0.000
1,3-Dimethyl-5-ethylbenzene	A10	0.0013	0.0056	0.001	0.001
t-Decahydronaphthalene	A9	0.0003	0.0015	0.000	0.000
1,2-Methyl-n-propylbenzene	A10	0.0002	0.0009	0.000	0.000
1,4-Dimethyl-2-ethylbenzene	A10	0.0009	0.0039	0.001	0.001
1,3-Dimethyl-4-ethylbenzene	A10	0.0008	0.0034	0.001	0.001

1,2-Dimethyl-4-ethylbenzene	A10	0.0010	0.0043	0.000	0.000
1,3-Dimethyl-2-ethylbenzene	A10	0.0002	0.0009	0.000	0.000
1,2-Dimethyl-3-ethylbenzene	A10	0.0009	0.0039	0.000	0.000
1,2-Ethyl-i-propylbenzene	A10	0.0003	0.0014	0.000	0.000
1,4-Methyl-t-butylbenzene	A11	0.0003	0.0014	0.000	0.000
UnknownC10s	U10	0.0207	0.0941	0.013	0.013
n-Undecane	P11	0.0058	0.0290	0.004	0.004
1,4-Ethyl-i-propylbenzene	A11	0.0002	0.0010	0.000	0.000
1,2,4,5-Tetramethylbenzene	A11	0.0006	0.0026	0.000	0.000
1,2-Methyl-n-butylbenzene	A11	0.0004	0.0019	0.000	0.000
1,2,3,5-Tetramethylbenzene	A11	0.0003	0.0013	0.000	0.000
1,2-Methyl-t-butylbenzene	A11	0.0007	0.0033	0.000	0.000
5-Methylindan	A11	0.0002	0.0008	0.000	0.000
1,2-Ethyl-n-propylbenzene	A11	0.0007	0.0033	0.000	0.000
2-Methylindan	A11	0.0003	0.0013	0.000	0.000
1,3-Methyl-n-butylbenzene	A11	0.0002	0.0010	0.000	0.000
1,3-Di-i-propylbenzene	A11	0.0003	0.0016	0.000	0.000
sec-Pentylbenzene	A11	0.0006	0.0028	0.000	0.000
n-Pentylbenzene	A11	0.0002	0.0010	0.000	0.000
1t-M-2-(4MP)cyclopentane	P12	0.0001	0.0005	0.000	0.000
1,2-Di-n-propylbenzene	A11	0.0005	0.0026	0.000	0.000
1,4-Di-i-propylbenzene	A11	0.0005	0.0026	0.000	0.000
Tetrahydronaphthalene	A10	0.0003	0.0013	0.000	0.000
Naphthalene	A10	0.0004	0.0016	0.000	0.000
1-t-Butyl-3,5-dimethylbenzene	A12	0.0001	0.0005	0.000	0.000
1,4-Ethyl-t-butylbenzene	A11	0.0003	0.0016	0.000	0.000
1,3-Di-n-propylbenzene	A12	0.0002	0.0010	0.000	0.000
UnknownC11s	U11	0.0095	0.0474	0.006	0.006
n-Dodecane	P12	0.0027	0.0147	0.002	0.002
1,3,5-Triethylbenzene	A12	0.0010	0.0052	0.001	0.001
1,2,4-Triethylbenzene	A12	0.0001	0.0005	0.000	0.000
1,4-Methyl-n-pentylbenzene	A12	0.0002	0.0010	0.000	0.000
n-Hexylbenzene	A12	0.0002	0.0010	0.000	0.000
1,2,3,4,5-Pentamethylbenzene	A13	0.0004	0.0019	0.000	0.000
2-Methylnaphthalene	A11	0.0002	0.0009	0.000	0.000
1-Methylnaphthalene	A11	0.0001	0.0005	0.000	0.000
UnknownC12s	U12	0.0039	0.0195	0.003	0.003
n-Tridecane	P13	0.0010	0.0059	0.001	0.001
UnknownC13s	U13	0.0022	0.0130	0.002	0.002
n-Tetradecane	P14	0.0004	0.0025	0.000	0.000
UnknownC14s	U14	0.0012	0.0076	0.001	0.001
n-Pentadecane	P15	0.0002	0.0013	0.000	0.000
UnknownC15s	U15	0.0006	0.0041	0.001	0.001
TOTAL		100.00000	100.00000	7.1700	7.1321

BTEX COMPONENTS	MOLE%	WT%	BTU @	14.730	14.650
BENZENE	0.0216	0.0539	LOW NET DRY REAL :	794.1 /scf	789.7 /scf
TOLUENE	0.0093	0.0274	NET WET REAL :	780.3 /scf	775.9 /scf
ETHYLBENZENE	0.0014	0.0048	HIGH GROSS DRY REAL :	865.4 /scf	860.7 /scf
XYLENES	0.0105	0.0356	GROSS WET REAL :	850.4 /scf	845.7 /scf
TOTAL BTEX	0.0428	0.1217	NET DRY REAL :	9651.0 /lb	9598.6 /lb
			GROSS DRY REAL :	10521.1 /lb	10464.0 /lb

RELATIVE DENSITY (AIR=1): 1.0794
 COMPRESSIBILITY FACTOR : 0.99732

(CALC: GPA STD 2145 & TP-17 @14.696 & 60 F)

*(DETAILED HYDROCARBON ANALYSIS/NJ 1993) ; ASTM D6730

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