

Started 4/11/77

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YIELDS

FAY	5.555 01	DRYGAS	6.074 05	MISTRA	9.750-09		
HP	3.540 02	OTHER	6.074 01	UNRETC	0.000 03	CH4	1.154 02
CT	2.420 01	SBY	5.165 01	CO	2.365 02	CO2DRC	3.255 01
MH2O	5.425 01	CO2	1.597 03	CILCOL	2.200 01		

VENTED GAS PATH

RECS	1.257 04	DPL	0.000 00	WVINTS	7.153 03	AIR	4.632 03
TRCS	1.237 04	TSF	0.000 00				

VOL WT & HEATING VALUE OF VENT GAS

MWVS	2.915 01	HVSI	6.110 02	AWDS	3.073 01	GRTU	1.005 02
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COMBUSTION PRODUCTS

CO2C	5.575 02	COO	2.174 02				
H2OC	2.315 01	COE	7.772 03	COYDOP	1.024 01		

MATERIAL IN

ORCVIN	2.254 02	RSE	4.950 02	ORHPL	3.113 01	NATIN	2.379 03
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MATERIAL OUT

ORCVGS	4.401 01	COYSD	2.545 01	UNRETH	0.000 02		
ORPCOL	1.441 02	ORWVQ	5.032 00	COYEH	1.551 00	UNRETC	0.000 03
ORVGL	1.803 01	ORCOLP	6.557 01	ORCVGP	1.943 01	ORCBSP	1.565 01
WCCV3P	3.524 00						

MATERIAL BALANCES

CVALL	9.299 01	ORCH2	9.299 01				
ORHAL	2.875 01	ASH	0.000 00	TC	2.913 01	WATER	9.047 01
ORCC	9.377 01	TRD	0.375 01	GASL	-2.002 02	ASHD	-1.000 00

HEAT IN

COYEB	4.337 03	ORWQO	5.422 03	CAIP	7.571 05		
ORPCP	2.000 00	COILC	1.200 04	ORCYL	5.023 04	ORHPLI	5.170 03

HEAT OUT

ORCORO	1.353 03	ORTRCO	0.920 04	ORPCV	4.737 04		
OLIFC	4.242 03	ORFBAS	3.215 04	COO	1.224 05	OBASL	-1.417 03
LELOSS	0.000 00	NETLOC	2.345 04	ORHYSI	5.170 05		

MISCELLANEOUS

ORCSS	2.171 05	VPCIL	5.203-00	TGL	4.962 03	VPC	6.715 00
BCA	1.237 01	PROF	0.000 00				

MATERIAL AND HEAT BALANCE INPUT SHEET

RIF 921, RUN NO. C-1 8-7 STARTED 4-14-71 CALC. ON

101 100 61 -1 27388 04
 H₂O, wt% Oil, wt% °F (1) Rate, lbs/hr

2603 203 1705 55022
 Oil, gal/T Gas+L, wt% CO₂, wt% Retort XS, ft²

6806 1601 1068 24010 139
 Ash, wt% Carbon, wt% H₂, wt% Bar. Press, " H₂ Offgas Temp, °F

RAW SHALE
 BAROMETR
 PRESSU
 AND
 OFFG
 TEMPERATU

107602 100 150 128 0014 0
 Chart Reading Meter Factor Temp, °F Press, "H₂O gauge Moist, lbs/msec Heat Loss, Btu/hr

AIR

296508 100 250 71 000 000
 Recycle Ch. Rate Meter Factor Temp, °F Press, "H₂O gauge Tot Gas Ch. Rate Meter Factor

RECYCLE AIR
 TOTAL GAS

000 000 0 0
 Dil Gas Ch. Rate Meter Factor Temp, °F Press, "H₂O gauge

DILUTION
 GAS

000 0 0 27607 000
 C₂ Retort No. R. Temp, °F Press, "H₂O gauge Water added, lbs/hr Nucl. Agent, lb/hr

PROPANE, WH
 & NUCLEATI
 AGENT

004 000 000 000
 H₂O, wt% Oil, wt% Gas, wt% Rate, lbs/hr

SPENT
 SHALE

1405 8400 6013 0016 396
 CO₂, wt% Ash, wt% Carbon, wt% H₂, wt% Temp, °F

234800 8401 1101 70793 23109
 Dry Oil, lbs/hr Carbon, wt% H₂, wt% Den, lbs/gal Water, lbs/hr

LIQUID
 PRODUCT

164905 100 243 000 000 0 1203
 Vent + Dil Gas Chart Reading Meter Factor Temp, °F Moist, lbs/msec Mist, lbs/msec (2) Carbon, lbs/msec

VENT +
 DILUTION
 GAS,
 VENT PUR
 GAS, AN
 TOP SEAL
 GAS

0 2603 004 6100 109 309 505
 (3) CO₂, vol% O₂, vol% N₂, vol% CH₄, vol% CO, vol% H₂, vol%

100 0080 1504
 Other, vol% H₂, lbs/msec V. Purge Ch. Reading

1083 174 163 75 2309 806 1106
 Meter Factor Temp, °F Press, "H₂O gauge Cond. Gas Cut Temp, °F Dry Oil, gal/hr Water, lbs/hr Top Seal Gas Rate, scfm

OPTIONS:

- (1) Insert "0" to calc. with measured rates; "1" to calc. with spent shale rate and ash analyses; "-1" to calc. with raw shale rate and ash analyses.
- (2) Insert "1" to calc. with measured moisture and mist; "0" to calc. from vent purge data.
- (3) Insert "0" for Retort No. 3 (pressure and temperature have no effect on gas rates); "1" for Retort No. 1&2 (pressure and temperature have effect on gas rates).

LABORATORY ANALYSIS SHEET

ANVIL POINTS OIL SHALE RESEARCH CENTER

Date Sampled 4-15-67

Run No. C1028-7

Sample Time: RS 0615; SS 1115

FISCHER ASSAY

JA RAW SHALE *R* SPENT SHALE

<u>26.1</u>	<u>0.0</u>	Gal/Ton
<u>0.908</u>	<u>—</u>	S.G., g/ml
<u>10.0</u>	<u>0.0</u>	Oil, wt %
<u>1.8</u>	<u>0.4</u>	Water, wt %
<u>85.9</u>	<u>99.5</u>	Sp. Shale, wt %
<u>2.3</u>	<u>0.1</u>	Gas & Loss, wt %
<u>Slight</u>	<u>None</u>	COKING TENDENCY

RETORT SHALE MOISTURE

1.055 wt %

JKM RAW SHALE FISCHER ASSAY MOISTURE

0.66 wt %

MINERAL CO₂

JKM 17.5 *JKM* 14.5 wt %

ASH (SHALE)

JKM 68.4 *JKM* 54.0 wt %

MOISTURE

JKM 0.24 *JKM* 0.09 wt %

CARBON

JKM 16.1 *JKM* 6.13 wt %

HYDROGEN

JKM 1.62 *JKM* 0.16 wt %

BENZENE EXTRACTABLES

— — wt %

SHALE RICHNESS DISTRIBUTION
(See attached graph)

SCREEN ANALYSIS
(See back of this sheet)

All results are "as received" unless noted. "Moisture" designates the moisture content of the -48 mesh material used for "Ash", "Mineral CO₂", "Carbon", and "Hydrogen". The "FA Moisture" is for the sample used for the Fischer Assay.

COMMENTS _____

DATE COMPLETED _____

CHECKED BY JKM

LABORATORY ANALYSIS SHEET

ANVIL POINTS OIL SHALE RESEARCH CENTER

Date Sampled 4-15-67

Run No. S 1025-7

0900

LIQUID PRODUCTS

D3 PUMPOUT

T3 PUMPOUT

J&Q

WATER, wt %

1 2 3 4 1 2
5.1

GRAVITY, °API

19.7

OIL ASH, wt %

DISTILLATION (See attached sheet - OSRC-24)

VENT PURGE PRODUCT

J&Q

OIL WT, g 287.0

WATER VOL, ml 6.0

GRAVITY OIL, °API 46.7

VENT GAS

MAJOR COMPONENTS

C₁ thru C₄, plus n-Pentane

CO₂ 26.3 vol %

O₂ 0.4 "

N₂ 60.3 "

CH₄ 1.9 "

CO 3.9 "

H₂ 5.5 "

Ar 0.7 "

Others 1.0 "

CH₄ _____ vol %

C₂H₄-C₂H₆ _____ "

C₃H₈ _____ "

C₃H₆ _____ "

i C₄H₁₀ _____ "

n C₄H₁₀ _____ "

∅C₃H₆ _____ "

n C₅H₁₂ _____ "

CARBON, 2.3 lbs/MSCFDG

HYDROGEN, 0.30 lbs/MSCFDG

COMMENTS _____

DATE COMPLETED 4-17-67

CHECKED BY [Signature]

SCREEN ANALYSIS DATA SHEET (TY-LAB)

RUN NO. 11-100-57 SAMPLE NO. _____ DATE 11-15-60
 UNIT 4.2 DESCRIPTION 725.1
 APPROX. SHALE SIZE _____ SHAKING TIME 5 min ANALYSIS BY J. J. ...
 TOTAL SAMPLE WT. GROSS 47.4 - TARE 1.6 = NET 45.8

SCREEN SIZE			WEIGHTS								
SCREENS REQD.	OPENING SIZE	MESH	GROSS LBS.	TARE LBS.	NET WT. RETAINED	SCREEN SIZE	D _i *	1/D _i	% RETAINED	CUM. % RETAINED	% PASSING
	4.25					4.25					
	3.00					3.00	(3.125)	(0.3200)			
	2.50		18.1	11.7	6.4	2.50	(2.625) 2.750	(0.3809) 0.3636	5.13		94.86
	2.00		21.7	2.2	19.5	2.00	2.250	0.4444	24.57		70.29
	1.50		11.0	5.0	6.0	1.50	1.750	0.5714	38.46		31.83
	1.05		27.8	11.0	16.8	1.05	(1.087) 1.275	(0.9193) 0.7843	22.01		9.82
	0.742		22.2	2.0	20.2	0.742	0.896	1.116	6.62		3.20
	0.525		19.0	16.5	2.5	0.525	0.634	1.577	1.07		2.13
	0.371		12.1	1.0	11.1	0.371	0.448	2.232	0.43		1.70
	0.263	3	19.4	1.0	18.4	0.263	0.317	3.154	0.21		1.49
	0.185	4	19.1	1.0	18.1	0.185	0.224	4.464	0.00		1.49
	0.131	6	17.4	1.9	15.5	0.131	0.158	6.329	0.21		1.28
	0.093	8	20.0	1.0	19.0	0.093	0.112	8.928	0.00	98.71	1.28
	0.065	10	21.0	1.0	20.0	0.065			0.00		1.28
	PAN		21.0	1.0	20.0	PAN			0.64	-	0.64
TOTAL ON SCREENS AND PAN					46.5	LOSS			0.64	-	0.64
LOSS (BY DIFFERENCE)					4.3	TOTAL			99.99		-
TOTAL SAMPLE WEIGHT					46.8						

* NUMBERS IN PARENTHESES SHOULD BE USED WHEN THESE SCREEN SIZES REPRESENT THE TOP OF THE SHALE SIZE RANGE.

REMARKS: _____

$\sum_{+8m}^m D_i$	1.71019	$\sum_{+8m}^m X_i$	
$1/\sum_{+8m}^m D_i$	0.64138	$\sum_{+8m}^m X_i / D_i$	
D _a	1.53902	$\sum_{+8m}^m X_i D_i$	
D _v	1.73253		