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MONTHLY REPORT

FOR THE PERIOD 1st OCTOBER - 31st OCTOBER, 1974

EXPLORATION LICENCE No. 4/74

LAND DISTRICT OF DEVON

LOCALITY OF LATROBE

NORTHERN TASMANIA

BY

L.G. NIXON

L.G.B. NIXON & ASSOCIATES

<u>CONTENTS</u>	<u>PAGE No.</u>
SUMMARY	1
INTRODUCTION	1
WORK DONE	2
FUTURE WORK	3
ESTIMATED EXPENDITURES	3

ATTACHMENTS

- APPENDIX I - Raw materials specification
- a) Petroleum coke (calcined)
  - b) High softening point coal tar pitch (Hard pitch)
- APPENDIX II Lurgi Mineral Technik GMBH - Test Report No. 76/74

19th November, 1974

MONTHLY REPORTFOR THE PERIOD 1st OCTOBER - 31st OCTOBER, 1974EXPLORATION LICENCE No. 4/74LAND DISTRICT OF DEVONLOCALITY OF LATROBENORTHERN TASMANIASUMMARY

The field work done in the current period was directed mainly at examining the occurrences of oil shale in the China Flat and Knight-Churchill areas, in connection with the possibility of open cutting these deposits.

During this period the writer had discussions with Mr. H. Payne, Acting Commissioner of Forests and with the Secretary and Director of Mines in Hobart.

INTRODUCTION

During the month a report was received from Lurgi on the sample forwarded for testing using the Lurgi-Rhurgas process (See Appendix I attached). This report confirmed the suitability of the Lurgi-Rhurgas process for treating the Tasmanite shale and outlined further tests on the shales.

The Director of Mines Tasmania advised that the Chemical and Metallurgical Branch had carried out beneficiation tests on the Tasmanite for the production of concentrates in connection with the production of bitumen for use in highway surfacing.

Concentrates and bitumen products from the shale are kept in the Department's store shed near the old retort adjacent to the Goliath Mines. The Department has offered to provide some of this material for laboratory testing. In addition the Department has arranged for the writer to examine and copy in Hobart all relevant documents in connection with the beneficiation tests carried out by the Chemical and Metallurgical Branch.

The writer wishes to record his appreciation for the help and ready assistance that he has received from the Secretary, Chief Geologist and Director of Mines during the period he has held the Exploration Licence.

#### WORK DONE

The writer held discussions with Darvy Ashmore, Consultants and with Comalco in Melbourne in connection with the sale and specifications of calcined petroleum coke, pitch and gasses.

The writer accompanied Mr. R. Clements, Consultant Mining Engineer and Mr. B. Pertz, Geologist of Endeavour Oil Company to the Oil shale deposits. The main objectives of this visit were to have the Consultant Engineer examine the oil shale occurrences on the ground and to look into the viability of open pit mining in the area and to make the geologist familiar with the locations of the various deposits.

Discussions were held in Hobart with the Assistant Commissioner of Forests in connection with the possible mining developments in the area.



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TOTAL ESTIMATED EXPENDITURES

May to June	\$2,456.70
June to July	1,869.45
1st Aug. to 31st Aug.	500.00
1st Sept. to 30th Sept.	2,717.56
1st Oct. to 31st Oct.	3,874.14
	<hr/>
	\$11,417.85
	<hr/>

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19th November, 1974

51000 tonne / yr US\$ 66 per MT + approx US\$ 20 of freight  
 Say A\$60 C+F

**COMALCO**  
**ALUMINIUM**

# RAW MATERIALS SPECIFICATIONS

BELL BAY PLANT

PAGE 1 OF 3

## PETROLEUM COKE (CALCINED)

APPROVED BY:	SPECIFICATION No.	CP - 09
PRODUCTION DEPT. PER <i>R. H. Stephens</i>	ISSUE No.	4
SUPPLY DEPT. PER <i>[Signature]</i>	DATE ISSUED/REVISED	24th September '69
TECHNICAL SERVICES PER <i>[Signature]</i>		

1. SCOPE : This specification covers calcined petroleum coke used in the manufacture of anode blocks.
2. PHYSICAL STATE : Crushed Solid.
3. UNIT WEIGHT : -8+14 Tyler screen fraction 48lbs. \* per cu. ft. min. as poured. Desired range 52 - 55lbs. per cu. ft.
4. PACKAGING : Not applicable.

5. CHEMICAL COMPOSITION		Allowed Maximum	Desired Maximum
Ash	%	0.50	0.40
Volatile Matters	%	0.50	0.40
Sulphur (S)	%	1.25	1.10
Silicon (Si)	%	0.03	0.02
Iron (Fe)	%	0.05	0.03
Calcium (Ca)	%	0.12	0.12
Sodium (Na)	%	0.12	0.12
Nickel (Ni)	%	0.035	0.030
Vanadium (V)	%	0.035	0.030
Moisture as shipped (H <sub>2</sub> O)	%	0.25	0.15

CRITICAL ELEMENTS :- Fe, Si, Ni, V, Ti.

Other elements :- S, Ca, Na.

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BELL BAY PLANT

## RAW MATERIALS SPECIFICATIONS

PAGE 2 OF 3

PETROLEUM COKE (CALCINED)	
APPROVED BY:	SPECIFICATION No. CP - 09
PRODUCTION DEPT. PER <i>R. H. Stephens</i>	ISSUE No. 4
SUPPLY DEPT. PER <i>[Signature]</i>	DATE ISSUED/REVISED 24th September '69
TECHNICAL SERVICES PER <i>[Signature]</i>	

## REPRINT ONLY

6. **PHYSICAL PROPERTIES :** Real specific gravity 2.04 - 2.07  
Specific resistivity OHMS/Cu. in. 0.045  
max (by GLCC<sup>N</sup> Method)
7. **SAMPLING & ANALYSIS :** The vendor shall take a representative sample of the material to be shipped. The sample shall be analysed by the vendor in accordance with the chemical and physical properties.
8. **REPORTING :** The vendor shall report the actual analysis and certify that the material fully meets specifications for chemical and physical composition. Certification shall be sent in three copies to Supply who will forward a copy each to:  
Carbon Products Supt.  
Technical Services Manager.

HIGH SOFTENING POINT COAL TAR PITCH (HARD PITCH)

APPROVED BY:	<i>[Signature]</i>	SPECIFICATION No.	CP - 06
PRODUCTION DEPT. PER		ISSUE No.	2
SUPPLY DEPT. PER <i>[Signature]</i>		DATE ISSUED/REVISED	17th July '67
TECHNICAL SERVICES PER <i>[Signature]</i>			

- 1. SCOPE : This specification covers hard pitch used in the manufacture of anode blocks.
- 2. PHYSICAL STATE : Solid.
- 3. UNIT WEIGHT : Approx. 75lbs per Cu.Ft.
- 4. PACKAGING : Shipped in 28 Gauge 5 Cwt capacity drums.
- 5. CHEMICAL COMPOSITION:
  - Softening Point (cube in air) °C 108-112
  - Benzene insoluble (BI) % 30 min.
  - Quinoline insoluble (QI) % 8 min.
  - Beta resin (BI-QI) % 20 min.
  - Water % 0.05 max.
  - Sulphur (S) % 0.75 max.
  - Iron (Fe) % 0.05 max.
  - Silicon (Si) % 0.03 max.
  - Specific gravity 60/60°F 1.32 min.
  - Distillate at 360°C % 4.0 max.
  - Coking value - Conradsen 55 - 65
- 6. PHYSICAL PROPERTIES : Included above
- 7. SAMPLING & ANALYSIS : The vendor shall take a representative sample of the material to be shipped. The sample shall be analysed by the vendor in accordance with the chemical composition.

VERSTÜCKBERICHT

Nr. 76/74

APPENDIX II

Analytical examination of a sample of oil shale supplied  
by Endeavour Oil Co., Australia

BKU-50-3804

on 9th July, 1974, Lurgi Code No. 30/74.

1. Bulkiness	wt%	3.2
2. <u>Administration Agency:</u>		
<u>(Lurgi 520 10)</u>		
Bulkiness	wt%	3.2
Ash content	"	3.6
Moisture	"	9.0
Total ash	"	10.3
Total loss	"	3.4

Frankfurt/Main, den 3rd October, 1974  
DrEm/Cpa

Bearbeiter: Dr. Bußmann

Laborleitung: 

Verteiler:

DrSa/DrEm

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Forschungslaboratorium

Frankfurt, 3rd October, 1974  
DrEm/Cpa

Test Report No. 76/74

Subject

Analytical examination of a sample of oil shale supplied by Endeavour Oil Co., Australia

BKU-50-3804

Sample Identification

approx. 15 kg of oil shale, grey-brown pieces, received on 9th July, 1974, Lurgi Code No. 30/74.

5518 (1210)  
5066 (1210)

Results

1. Moisture: wt% 3.2

2. Carbonization Assay:  
(Fischer 520 °C)

Moisture	wt%	3.2
Gas Liquor	"	3.6
Tar	"	9.0
Residue	"	80.8
Gas and Loss	"	3.4

3. Carbon content of carbonization residue

HCl-treatment of residue; yield	91.4 wt%
Carbon content of HCl-treated residue:	6.6 "
Carbon content converted to original residue:	6.0 "

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4. Ultimate Analysis

HCl-treatment of original shale; yield: 89.4 wt%

<u>Basis</u>	<u>HCl-treated shale</u>	<u>Original shale</u>
Moisture	-	3.2
Carbon	15.9	14.2 (calculated)
Hydrogen	1.9	1.7 (calculated)
Sulphur	-	2.1
Chlorine	-	0,07

5. Calorific Values

<u>Basis</u>	<u>HCl-treated shale</u>	<u>Original shale</u>
HCV KJ/kg (kcal/kg)	6222 (1486)	5518 (1318)
LCV " (" )	5803 (1386)	5066 (1210)

6. Retorting-Test

Shock-heating in a closed steel vessel introduced into a muffle furnace at 550 °C

Size range of input: oil shale	0 - 6.3 mm	145
Moisture: (on oxidation)	5.5 wt%	185
Input weight:	795.9 g	25.8 wt%
Residue:	614.5 g	
Yield:	77.2 wt%	

HCl-treatment of residue; yield	90.8 wt%
Carbon content of HCl-treated residue:	6.6 "
Carbon content converted to original residue:	6.0 "
Sulphur content of original residue:	1.8 "
Chlorine content of original residue:	0.03 "

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**LURGI MINERALÖLTECHNIK GMBH  
FRANKFURT (MAIN)**

**Forschungslaboratorium**

- 3 -

**7. Screen Analysis Retorting-Test**

Screen Fractions	Original feed to retort	Residue from retorting test
5.000 - 6.300 mm wt%	7.6	5.9
3.000 - 5.000 " "	24.6	21.2
2.000 - 3.000 " "	13.0	4.9
1.000 - 2.000 " "	15.9	11.2
0.500 - 1.000 " "	10.8	11.8
0.200 - 0.500 " "	12.9	15.6
0.100 - 0.200 " "	5.7	11.6
0.063 - 0.100 " "	3.8	7.1
- 0.063 " "	5.7	10.7
Mean grain size mm	2.117	1.642
in % of feed	100.0	77.6

**8. Hardgrove Grindability Index**

Residue from retorting test: 145  
 Residue of original oil shale oxidized at 650°C: 183  
 (Loss of weight on oxidation: 25.8 wt%)

**9. Reick-Degassing**

Input: 100 g  
 Moisture: 3.2 wt%  
 Grain size of input: 0 - 1 mm

Frankfurt

Labor für Kohlen- und Mineralöltechnik

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- 4 -

Gas fractions °C	-350	350- 450	450- 500	500- 550	Flush Gas	Total Gas
Gas yield (N <sub>2</sub> +O <sub>2</sub> free) 1 (≅ N1)	0.020	0.394	0.373	0.274	0.274	1.334
Gas analysis						
CO Vol%	1.85	12.06	5.76	1.28	1.50	5.76
CO <sub>2</sub> "	87.04	55.08	17.54	9.91	19.44	28.48
H <sub>2</sub> "	-	3.73	17.46	25.45	34.88	18.37
CH <sub>4</sub> "	10.37	14.87	26.93	42.88	31.73	27.38
C <sub>2</sub> H <sub>6</sub> "	-	4.51	11.37	8.28	5.32	7.30
C <sub>2</sub> H <sub>4</sub> "	-	1.99	2.78	2.13	-	1.80
C <sub>3</sub> H <sub>8</sub> "	-	1.94	4.98	2.59	1.33	2.77
C <sub>3</sub> H <sub>6</sub> "	0.37	2.12	4.93	3.22	1.83	3.05
C <sub>4</sub> H <sub>10</sub> "	-	0.96	2.42	0.98	0.50	1.26
C <sub>4</sub> H <sub>8</sub> "	0.37	2.63	5.26	3.16	1.83	3.27
H <sub>2</sub> S "	-	0.13	0.59	0.13	1.67	0.57
Density kg/m <sup>3</sup> (≅ kg/Nm <sup>3</sup> )	1.835	1.611	1.221	0.905	0.882	1.211
HCV kcal/Nm <sup>3</sup> (H <sub>2</sub> S-free) KJ/m <sup>3</sup>	1234 5167	4970 20809	10172 42590	9192 38487	6343 26558	7515 31465
LCV kcal/Nm <sup>3</sup> (H <sub>2</sub> S-free) KJ/m <sup>3</sup>	1121 4694	4580 19176	9308 38973	8331 34882	5701 23870	6849 28677

Bußmann

Labor für Kohletechnik

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**LURGI MINERALÖLTECHNIK GMBH  
FRANKFURT (MAIN)**



Telegramm Lurgitechnik  
Telefon (0611) 1571  
Telex 0411643  
Postscheckkonto Frankfurt (Main) (BLZ 50010060) 4960-601

Bankverbindung Metallgesellschaft AG., Frankfurt (Main) (BLZ 50220400) Kto. Nr. 1990090

Amtsgericht Frankfurt (Main) HRB 9123

Lurgi Mineralöltechnik GmbH · 6000 Frankfurt (Main) 2 · Postfach 119181

Endeavour Oil Company N.L.  
232 Victoria Parade, East Melbourne  
P.O. Box 173, East Melbourne,

Victoria, Australia, 3002


**AIRMAIL**

Wir bitten in Antwortschreiben stets unsere Zeichen und den Betreff genau anzugeben.

Ihre Nachricht/Zeichen

Unsere Zeichen  
**DRWE/Ldm/Stwt**

Telefon  
(0611) 157

6 Frankfurt (M)  
**3rd October, 1974.**

Dear Sirs,

**BKU-50-3804, Laboratory Tests on Australian Oil Shale  
Your letter of 2nd July, 1974**

Now that the laboratory tests on your oil shale have been terminated, we have pleasure in enclosing our test report No. 76/74.

With reference to our test report, we should like to make the following comments:

1. The moisture of the tested shale is between 3.2 and 5.5 % by weight (Retoring Test).

When the oil shale is subjected to distillation, this water accumulates in the condensation unit, together with the gas liquor (decomposition water). In an industrial plant it can well be used for moistening the shale ash. Another advantage in the use of the liquor to this end is that the impurities, such as NH<sub>3</sub>, oil, sulphur, compounds and phenols, contained in the gas liquor in low concentration are likely to be absorbed by the residue so that in all probability the liquor will need no treatment.

2. The tar content of 9 % by weight (Fischer Carbonization Assay) is about 4 % by weight lower than had been assumed in your letter of 2.7.1974. It lies about half-way between American Colorado oil shale (approximately 13 %) and German oil shale (approximately 4-5 %). Considering the current world market prices of crude oil, its distillation is expected to be profitable unless the costs for mining the oil shale are too high.

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Endeavour Oil Co. N.L.  
Victoria, Australia, 3002

DRWE/Ldm/Stwt

3 Oct. '74

2

- 3. The organic carbon in the carbonization residue is determined in the carbonate-free residue. The carbonates are therefore decomposed by means of HCl and are driven off as CO<sub>2</sub> or washed out as chlorides.

The carbonization residue with a carbonate content of 8.6 % still contains 6 % organic carbon. This coke residue will probably cover the fuel requirements for the distillation of the oil shale in an LR-Retort.

- 4. The ultimate analysis of the oil shale gave a C/H ratio of 8.35.

The total hydrogen content of the oil shale is 1.7 % by weight. It is about 30 % consumed in the formation of gas liquor and distillation gases. This leaves a rest of approximately 1.2 % by weight H<sub>2</sub> for the formation of oil and tar. On the assumption of a C/H ratio of 7.6 in the shale oil (Colorado shale oil), a maximum of 10 % by weight shale oil is recoverable.

Of the sulphur (2.1 % by weight) originally contained in the oil shale, approximately 66 % is left in the residue, as shown by the result of the Retorting Test.

The remaining sulphur is contained in the oil and in the distillation gas where it will result in a theoretical sulphur content of approximately 5-6 %.

This sulphur will be removed by subsequent hydrogenation of the shale oil, which is indispensable.

- 5. The calorific value (gross calorific value and net calorific value) was determined on carbonate-free shale, in order not to adulterate the determination by the endothermic heat of decomposition. A determination of the calorific value of the original oil shale shows that, in fact, approximately 1-3 % of the calorific value gets lost by carbonate decomposition.

- 6. The Retorting Test was carried out on about 800 grams of oil shale in a steel retort protected by inert gas (nitrogen) and placed in a muffle furnace at a temperature of 800°C, where it was heated to 550°C. The heating period ended after approximately 15 minutes. The loss in weight corresponded approximately to the percentage of gas liquor, tar, gas and loss and the shale moisture of 5.5 % by weight, as expected on the basis of the carbonization assay.

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Victoria, Australia, 3002

DRWE/ldm/Stwt 3 Oct '74

3

7. It follows from the screen analysis of the shale retorted in the test and of the residue obtained that during the Retorting Test the grain size decreased by 22.4 % on the average. It can be inferred from this value that the distilled oil shale can well be used as heat carrier in the LR recycle system.
8. The Hardgrove Grindability Index is a certain measure of the strength of the residue. This Index was first determined on the carbon-bearing residue from the Retorting Test, such as that which, by way of comparison, is obtained in the LR mixer, and then on the carbon-free shale ash oxidized at 650°C, such as that which, by way of comparison, is obtained in the collecting bin above the lift pipe. The smaller this Index, the stronger is the material. As expected, the carbon-bearing distillation residue has a higher strength than the burnt-out ash because, in a way, the organic substance has a binding effect. The measured Indexes of 145 and 183 respectively are much lower than the values known for Colorado oil shale so that a higher strength of the grains is to be expected and hence a residue which will be very suitable for use as heat carrier in the LR process.
9. It follows from the Reick-Analysis that the oil shale gave approximately 1.3 percent by volume or approximately 1.6 percent by weight distillation gas. The calorific value (gross calorific value) of this gas amounting to approximately 7500 kcal/Nm<sup>3</sup> is relatively high so that this gas can well be supplied to other consumers. It could, for example, well be used in the supply of hydrogen to the shale oil hydrogenation unit which is to follow the LR plant.

To sum up, we consider the test results very encouraging and would deem it advisable to subject your oil shale to further tests.

You certainly know that the amounts of oil and water obtained in the laboratory tests were rather small so that it was not possible to analyse these products. Besides, the oil obtained in the Fischer Assay will hardly be representative of the oil producible by flash distillation in the LR plant.

We would therefore suggest that further tests be conducted in a laboratory apparatus which was recently finished and which is capable of continuously distilling approximately 1-2 kilograms per hour of oil shale under conditions which approach the LR process more closely than the equipment described above.

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Victoria, Australia, 3002

DRWE/Ldm/Stwt

3 Oct. '74

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The product to be obtained will be similar in quality to those of an LR plant.

The new apparatus makes it possible to produce over a period of, say, 8 hours such a quantity of oil as is necessary for more accurate analyses.

The analyses should include the following determinations:

Oil:	Density
	Viscosity (at 3 temperatures)
	Pour point
	Flash point
	Conradson Test
	Gross and net calorific values
	Ultimate analysis
	Boiling curve
Gas:	Gas composition
	Density
	Calorific values
Residue:	Carbon content

Apart from the product analyses, this apparatus permits the determination of the optimum distillation temperature at which the highest yield of oil is attained, by distillation at, say, three different temperatures.

The costs of the tests including a Fischer Assay on the shale and 3 screen analyses (original shale, distilled shale, distilled and burnt shale) are estimated at about DM 6,000 plus DM 4,000.-- for each test repeated at another distillation temperature.

A complete test including the determination of the optimum distillation temperature (3 tests) is therefore expected to cost DM 14,000.-- and to require approximately 50 kg of oil shale.

We hope that, following the necessary test runs, our apparatus will be available for flash distillation of your oil shale by the beginning of 1975. Should these tests be just as successful as the previous ones, consideration could be given to the next step, namely the performance of distillation tests in an LR pilot plant of which we may avail ourselves and which has an oil shale throughput capacity of up to 0.15 tons per hour. This test would be conducted over a week and need approximately 15-20 tons of oil shale.

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3 Oct. '74

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The last step before the installation of an LR plant could be a feasibility study to be prepared by us on the distillation of your oil shale by the LR process.

We should be pleased to further assist you in finding the optimum solution of how to use your oil shale and look forward with interest to your comments.

With kind regards.

LURGI MINERALÖLTECHNIK GMBH

*i. V. Wal* *i. P. Pankhold*

Enc

Test Report No. 76/74 in triplicate