Release Date
June 17 2005

ROUTINE ROCK PROPERTIES ANALYSIS
for

DEVON CANADA CORPORATION

DEVON KOTANEELEE
E – 37
2003-02

Core Laboratories Canada Ltd.

52131-03-0216

Petroleum Services Division
Core Laboratories Canada, Ltd.
2810 - 12 Street N.E.
Calgary, Alberta, Canada T2E 7P7
Tel: (403) 250-4000
Fax: (403) 250-5120
www.corelab.com

Core Lab
RESERVOIR OPTIMIZATION

June 17, 2003

Devon Canada Corporation
1600, 324 – 8th Avenue S.W.
Calgary, Alberta T2P 2Z5

Attention: Mr. Glyn Webb

Subject: DEVON KOTANEELEE E-37

The subject core was viewed at the Geological Survey Of Canada facility located in Calgary by representatives of Devon Canada Corporation and Core Laboratories. The purpose of the core viewing was to discuss ways in which the original porosity data, which was acquired in 1978, could be validated.

It was decided that since the core had been slabbed, a slightly different method than the usual would have to be utilized to determine the porosity of each sample in question. A total of sixteen samples were selected for testing. These included fourteen of the original full diameter plug samples and two small plugs that were drilled out of full diameter plug sample numbers 31 and 151. These small plugs were 1 inch in diameter and were drilled sometime between 1978 and the present for reasons unknown.

In order to calculate a porosity in the lab we must determine two parameters, which are grain volume and bulk volume. The grain volumes in this case were determined using Boyles' Law Technique using Helium as the gaseous medium. This technique is described in detail in "Recommended Practices for Core Analysis, Recommended Practice 40, Second Edition, February 1998" which is published by the American Petroleum Institute, 1220 L Street N.W., Washington, D.C. 20005. The Core Laboratories' procedure for determining grain volume is included in Appendix 1.

The bulk volumes for these samples were determined by "Archimedes Principle" which states that "an object immersed in a fluid is subject to a force equal to the weight of the fluid it displaces". The fluids that were used in this analysis was mercury for the 2 small plugs, and water for the fourteen full diameter plug samples. This technique is also described in API RP 40 as noted above for grain volume determination. The Core Laboratories' procedure for determining bulk volume by Archimedes principle is included in Appendix 2. This procedure refers to mercury being the fluid, but water can also be used as the immersion fluid. The full diameter plug samples that had surface vugs were wrapped in a layer of "Saran" wrap to prevent water from entering the vugs, which would decrease the measured bulk volume, which in turn, would decrease the calculated porosity. However, the volume of the "Saran" wrap could influence the porosity in the other direction.

The data from this testing is presented in tabular format in the next few pages. The raw data used for the calculations can be found in tabular format in Appendix 3.
The individuals responsible for this testing on behalf of Core Laboratories are Dave Brooks, Lou Monahan, and Derrick Davis. Short resumes for these three individuals are included in Appendix 4.

Thank you for the opportunity to be of service.

Yours truly,

CORE LABORATORIES CANADA, LTD.

David J. Brooks
Supervisor, Routine Rock Properties

DJB/djd
Enclosures

Core Lab
PETROLEUM SERVICES

Company : DEVON CANADA CORPORATION
Well : KOTANEELEE E-37
File : 52131-03-0216

Date : 6/18/03
Analyst : DB, DD

Sample #	Depth Top ft	Depth Bottom ft	K (matrix) mD	K (fracture) mD	Porosity frac.	Porosity Original 1978 Frac.	Bulk Density kg/m3	Grain Density kg/m3	Sample Wrapped for Bulk Volume
FD13	12812.9	12814.2			0.047	0.053	2420	2540	No
SP31	12831.7	12832.8	0.07	1.46	0.029	0.051		2730	
FD32	12832.8	12834.2			0.032	0.031	2670	2760	No
FD38	12838.2	12839.2			0.025	0.028	2750	2820	No
FD85	12884.6	12885.7			0.044	0.041	2560	2680	Yes
FD104	12901.5	12902.3			0.021	0.022	2710	2770	Yes
FD130	12931.2	12932.2			0.025	0.032	2690	2750	No
FD141	12941.2	12942.3			0.023	0.020	2760	2820	No
SP151	12950.3	12950.8	0.35	2.89	0.024	0.039		2800	
FD169	13132.9	13133.5			0.042	0.046	2720	2840	Yes
FD189	13146.7	13147.7			0.031	0.032	2760	2850	Yes
FD200	13156.5	13157.3			0.013	0.027	2810	2840	No
FD222	13173.4	13174.4			0.057	0.055	2670	2830	Yes
FD228	13177.7	13178.7			0.021	0.022	2670	2830	Yes
FD232	13181.3	13182.2			0.084	0.088	2590	2830	Yes
FD236	13184.1	13185.1			0.056	0.053	2660	2820	Yes

TITLE	MODIFIED USBM HOLDER (POROSIMETER) - FULL DIAMETERS		
CONTROL NO.	REVISION NO.	EFFECTIVE DATE	AUTHORIZATION
CG-RRPP-R20	0	2001 03 14	

1.0 **Scope:**

1.1 This is a detailed procedure for measurement of grain volume conducted on full diameter samples as determined by Boyle's law, using helium as the gaseous medium on a U.S.B.M. (United States Bureau of Mines) modified porosimeter to produce core analysis data fundamental to petroleum reservoir evaluation.

2.0 **Reference:**

2.1 Core Laboratories Canada Ltd. Methodology.

3.0 **Responsibility:**

3.1 The Department Manager shall be responsible for ensuring compliance with this procedure.

3.2 The Laboratory Supervisor and/or co-ordinator shall be responsible for ensuring staff are adequately trained and comply with this procedure.

3.3 The analyst shall be responsible for ensuring performance of testing is in compliance with this procedure.

4.0 **Particulars:**

4.1 Full diameter sample(s) must first be cut from core.

4.2 Sample number and well code must be clearly written on the top of the sample with a solvent resistant marker.

4.3 Samples should be cleaned of fluids in a solvent extractor and dried in a gravity oven (duration of cleaning varies greatly depending on core type and oil viscosity, they should be dried for at least 48 hours).

5.0 **Safety:**

5.1 Lab coat and safety glasses must be worn.

6.0 **Apparatus and materials:**

6.1 U.S.B.M. modified porosimeter (including different sleeve and blank sizes).

6.2 Helium bottle (Minimum 500 psi.)

6.3 Computer.

7.0 **Action:**

7.1 **Equipment preparation:**

7.1.1 Turn on helium source.

7.1.2 Select proper sleeve and blank size to match FD diameter (4", 3.5", 3", 2.8", 2.5").

7.1.3 Flex porosimeter several times:

a) Open source valve.
b) Open supply valve.
c) Open exhaust valve.
d) Close holder valve.
e) Close source valve - open holder valve - close holder valve - open source valve.
f) Repeat Step 7.1.3 e) several times.

7.1.4 Zero Heise gauge:

a) Open source valve.
b) Open supply valve.
c) Open exhaust valve.
d) Close holder valve.
e) Adjust needle by turning regulator valve (needle should be exactly at the 100 mark).
f) Close source valve.
g) Close supply valve.
h) Close exhaust valve.
i) Open holder valve.
j) Adjust gauge by turning the dial at the bottom of the gauge (needle should be exactly at the 0 mark).
k) Repeat Steps a) to j) until you do not have to adjust the needle or gauge.

8.0 **Sample analysis:**

8.1 If computer is at C: prompt, type Win and press 'Enter'.

8.2 Type in the logon password which is RRP, press 'Enter' (The computer will automatically take you into lotus 1-2-3 program).

8.3 In lotus type / (forward slash), then F (file), then R (retrieve), this will give you a list of blank as well as ran files.

8.4 Select blank file according to FD size (eg. For 4 inch core select FD4.wk1, for 3.5 inch core select FD35.Wk1 and so on), press 'Enter'.

8.5 At the top of next menu will be FD size you selected before, selected it again on this menu, press 'Enter'.

8.6 Type in file number (do not use dashes or letters), press 'Enter'.

8.7 Type in your initials then press 'Enter'.

8.8 Obtain dead volume of porosimeter by doing the following:

a) Insert all blanks into porosimeter holder.
b) Go through Steps 7.1.3 and 7.1.4 if they are not done already.
c) Close source.
d) Close supply.
e) Close exhaust.
f) Open holder.
g) Take reading from gauge.

8.9 Type the dead volume reading from Step 8.8 into computer and press 'Enter'.

8.10 Press 'Enter' on QC- prompt.

8.10.1 By the porosimeter there are several QC (Quality Control) samples of different sizes and known porosities. Select the size you are running in this particular file.

8.11 Weight QC sample. Type weight into computer, press 'Enter'.

8.12 Put QC sample into porosimeter and fill it up with blanks. As many blanks as possible should go into porosimeter without interfering with the closing of it's lid.

8.13 Run Gv of QC sample

a) Close source valve.
b) Close supply valve.
c) Close exhaust valve.
d) Open holder valve.

8.14 Press 'Enter' on length prompt in computer for QC sample (not needed).

8.15 Press 'Enter' on diameter prompt in computer for QC sample (not needed).

8.16 Press 'Enter' on sanding prompt in computer for QC sample (not needed).

8.17 Type in number of first FD that has to be run in this particular file, press 'Enter'.

8.18 Weight sample, enter into computer, press 'Enter'.

8.19 Type in length of full diameter, press 'Enter'.

8.20 Get average diameter of sample, enter into computer, press 'Enter'. (Samples that are cork-screw or have noticeable irregular cylindrical shape or deep grooves caused by drilling should have their volume measured by archimedes BV, consult with supervisor if unsure).

8.21 Enter sanding results (refer to Step 9.0), press 'Enter'.

8.22 Enter into computer the number of each blank that went into porosimeter, without comas or dashes, press 'Enter'.

8.23 By now the Heise gauge should be stable, take reading, enter this number into the computer, press enter once, this will give you the calculation for GD (grain density), which should be ± 10 of actual GD written on side of QC sample. Press 'Enter' a second time to go onto first sample.

8.24 Repeat Steps 8.17 to 8.23 with each sample, instead of writing first sample number write second and so on.

8.25 After last sample is entered, type 999 when asked for sample number, this will take you out of loop and allow you to enter reading for last sample.

9.0 **Sanding:**

Note: this procedure differentiates between natural and artificial porosity and may not be needed in many samples. Chips, drilling grooves, broken edges are not part of porosity as are vugs and many times it takes experience to tell them apart. Always consult with a senior technician on differentiating the two as the technicalities of this are beyond the scope of this manual.

9.1 With a plastic sleeve cover the round side of FD to be sanded, then fill up the gaps formed by missing rock. Do not apply pressure to sand.

9.2 Pour this sand onto receiving plate.

9.3 On flat ends of FD the plastic sleeve is not needed, just fill up gaps, not going over flat surface. Do not apply pressure to sand.

9.4 Pour this sand onto same receiving plate.

9.5 Pour all the sand from receiving plate into graduated test tube of at least 20ml capacity, record measurement.

10.0 **Calculations:**

10.1 Grain Volume is determined by Boyles Law

10.2 Grain Density = weight / Grain Volume

10.3 Bulk Volume = Length * Area

10.4 Pore Volume = Bulk Volume - Grain Volume

10.5 Bulk Density = Weight / Bulk Volume

10.6 Porosity = Pore Volume / Bulk Volume

10.7 Porosity Calculation Check = (Grain Density - Bulk Density) / Grain Density

TITLE	ABACUS – Small Plug Bulk Volume Determination Using Mercury Displacement		
CONTROL NO.	REVISION NO.	EFFECTIVE DATE	AUTHORIZATION
CG-RRP-R27	0	02 12 05	

1.0 **Scope:**

1.1 This procedure outlines the correct method of measuring the bulk volume of small plug samples by mercury displacement.

2.0 **Reference:**

2.1 Core Laboratories Canada Ltd. Methodology.

2.2 API Recommended Practice (API RP 40 Second Edition)

3.0 **Responsibility:**

3.1 The Departmental Manager shall be responsible for ensuring compliance with this procedure.

3.2 The Laboratory Supervisor and/or co-ordinator shall be responsible for ensuring staff are adequately trained and comply with this procedure.

3.3 The technician shall ensure that performance of testing is in compliance with this procedure.

4.0 **Particulars:**

4.1 The small plug samples will have been measured for Grain Density on the Extended Range Helium Porosimeter (CG-RRPP-R16) and for Permeability (CG-RRPP-R18) before measuring the Mercury Bulk Volume.

5.0 **Safety:**

5.1 Lab coat, safety glasses and latex gloves must be worn. Refer to MSDS for information on safe handling of mercury.

5.2 The ABACUS Mercury Bath must remain covered with its proper lid at all times when not being used. Replace lid whenever measurement is interrupted or suspended, however briefly.

5.3 Latex gloves must be used when measuring bulk volumes must be removed and disposed of in the waste bin before leaving the ABACUS room. Care must be taken that no mercury is carried from the room via shoes, clothing, or samples (especially samples with small fractures or samples that are very coarse-grained sandstones).

6.0 **Quality Control:**

6.1 ABACUS set-up and calibration shall be performed before measuring each sample or group of samples (see procedure, below).

7.0 **Action:**

7.1 **Apparatus and Materials:**

7.1.1 Computer with ABACUS Bulk Volume Program installed.

7.1.2 Lab-grade Mercury (contained in a stainless steel immersion bath).

7.1.3 Digital Thermometer (with external probe).

7.1.4 Scale (with data cable connected to computer).

7.1.6 Permeability / Bulk Volume data work sheet.

7.2 **Instrument Preparation:**

7.2.1 Ensure that the mercury bath is properly positioned on top of the scale.

7.2.2 Clean the surface of the mercury of any grit or contamination with acetone and cotton swabs.

7.2.3 Adjust brightness and contrast on the computer display.

7.2.4 Move the cursor on the computer control bar to 'SETUP', press 'ENTER'.

7.2.5 Screen displays 'Warning - Present worksheet....', press 'ENTER'.

7.2.6 Screen displays: 'Tech Name'. Press 'ENTER'.

7.2.7 Screen Displays: 'Date'. Press 'ENTER'.

7.2.8 Screen Displays: 'Job Number'. Press 'ENTER'.

7.2.9 Screen Displays: 'Enter Hg BV Correction Factor'. Enter the current calibration constant (e.g. 0.99752) and then press 'ENTER'. The Hg BV correction factor is posted on the wall next to the ABACUS apparatus.

7.2.10 Screen Displays: 'Enter number of samples'. It is only necessary to enter a '1', regardless of the actual number of samples.

7.2.11 Screen Displays: 'Enter Name or I.D....'. Press 'ENTER'.

7.2.12 Move control bar cursor to 'TEMP' by hitting the TAB key and then hit 'ENTER'.

7.2.13 Hold the thermometer probe submerged in the mercury bath until the reading stabilizes. Input this value and then hit 'ENTER'.

7.2.14 Move control bar cursor to 'MERBV' by using the TAB key. Lower the sample holder to the level of the mercury by pulling down the handle. Adjust the top-screw until the sample holder touches the surface of the mercury bath and the indicator LED lights. Press 'ENTER'. The screen displays the sample values. Beneath the sample values the words 'Unstable Weight' appear. When the reading is stable, the message disappears. Immediately press the SPACEBAR to tare the scale. Raise the lever and back off the top-screw. Repeat this tarring process to ensure a consistent contact point, otherwise sample values will not register correctly.

7.3 **Sample Measurement:**

7.3.1 Place the first sample to be measured under the tines of the mercury bath sample holder. Lower the lever to the down position and adjust the top-screw until the sample holder is just touching the surface of the mercury and the indicator light is illuminated. Press 'ENTER'.

7.3.2 When the sample is stable, the 'Unstable Weight' message will disappear. Press '1' or 'END' on the numeric keypad.

7.3.3 Record the value of the mercury displacement displayed on the screen in the column for 'Bulk Volume' on the data sheet.

7.3.4 Remove the small plug sample from the mercury bath and replace in the sample tray.

7.3.5 Repeat steps 7.3.1 to 7.3.4 for each sample.

NOTE: Broken samples are to be run one piece at a time and the sum of the pieces recorded as the Bulk Volume. Vuggy samples cannot be run by this method.

8.0 **Calculations:**

8.1 No calculations are required.

RAW DATA

	Weight grams	GV cc	BV cc	PV cc	Porosity	Bulk Density	Grain Density
13	3535.4	1392.523	1460.5	67.977	0.047	2421	2539
31	52.9907	19.438	20.008	0.57	0.028		2726
32	4172.4	1511.353	1561.3	49.947	0.032	2672	2761
38	3922.9	1390.881	1426.1	35.219	0.025	2751	2820
85	3795	1418.199	1483	64.801	0.044	2559	2676
104	3079.5	1110.375	1134.6	24.225	0.021	2714	2773
130	2771.5	1006.219	1031.5	25.281	0.025	2687	2754
141	4329.9	1535.551	1571.6	36.049	0.023	2755	2820
151	55.8842	19.925	20.416	0.491	0.024		2805
169	2427.8	856.194	893.7	37.506	0.042	2717	2836
189	4225.1	1483.139	1531	47.861	0.031	2760	2849
200	1428.2	502.237	508.7	6.463	0.013	2808	2844
222	2009	710.262	752.9	42.638	0.057	2668	2829
228	2171.6	766.729	783	16.271	0.021	2773	2832
232	2070.6	732.138	799.6	67.462	0.084	2590	2828
236	2642.7	938.013	994.1	56.087	0.056	2658	2817

KEY RESUMES

Lou Monahan has over twenty (20) years of experience in the Rock Properties department of CORE Laboratories. He has hands-on work experience in all aspects of conventional core analysis and many of the advanced rock properties tests. Lou performs many of the viewings for clients working with core and provides technical assistance and top of the line service. Details of technical experience include: quality control and equipment maintenance, receiving and shipping core, total and spectral gamma's with bulk density index, logging of samples for preliminary and final analysis, cutting and preparing full diameter and small plug samples (bayol, air, brine, water, and crude), lithological sample descriptions, retort and Dean Stark saturations, CO_2 and vapour phase extractors, permeability using Turret and Hassler, porosity measurements by ERHP and Hiese Gauge, Archimedes and callipered bulk volumes, coreseal, protecore, field recovery of core

Dave Brooks has 12 years "hands- on" experience in Conventional Core Analysis. Dave performs the majority of the viewings and client contacts to ensure client requirements are met. Details of technical experience include: equipment maintenance, receiving and shipping core, total and spectral core gamma's with bulk density index, sample selection for preliminary and final analysis, cutting and preparing full diameter and small plug samples using (bayol, brine, air, water, crude, liquid nitrogen) as lubricant, lithological sample descriptions, retort and dean stark saturations, operation of CO_2 and vapour phase extractors, permeability measurements using Turrets and Hassler holders, porosity measurements by ERHP and heise gauge, archimedes and calipered bulk volumes CMS 300 analysis (k at NOB), sponge core analysis. Responsible for data evaluation and Quality control.

Derrick Davis has 15 years of industry experience involving all aspects of conventional and oilsand core analyses. He has been employed with Core Laboratories since 1996. Prior to joining Core Laboratories Derrick was employed with AGAT Laboratories and Geotechnical Resources Inc. Derricks' main focus at Core Laboratories is coordinating all of the incoming work and ensuring that all of the client requests are met in a timely manner. His extensive experience includes core gammas, core photos, equipment calibration and maintenance, core viewings, sample selection and preparation, porosity and permeability determination, saturation determination by retort and Dean Stark. Derrick is also responsible for data verification and quality control.