

WESSEL-1

Conventional core analysis on sidewall cores. Well: Wessel-1

Springer, N.

Conventional Core Analysis for Amerada Hess A/S

Well: Wessel-I, Sidewall Cores

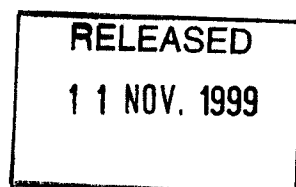
GEUS Core Laboratory

Niels Springer

Confidential report

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1. Introduction

By request of AMERADA HESS A/S, GEUS Core Laboratory has carried out conventional core analysis on rotary sidewall cores retrieved from the Wessel-1 well, Danish North Sea.

The analytical programme was specified in a letter from Mr. David Mackertich dated March 3, 1998. The following services are included:

- Conventional plug analysis
- Plug photography

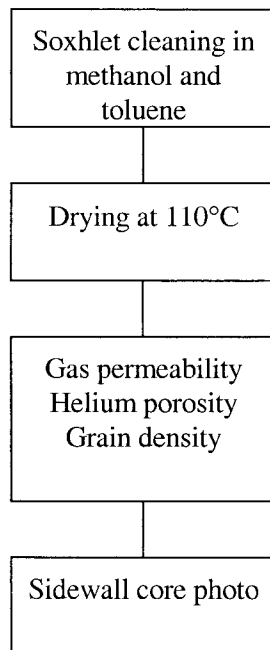
2. Sampling and analytical procedure

The laboratory received 10 rotary sidewall cores from Wessel-1 taken in the interval 2775 - 3141 meter measured depth, table 2.1. The cores were Soxhlet cleaned in methanol and toluene and dried at 110 °C. Routine core analysis data were measured except for the siltstones which had open fractures after cleaning and drying. Trimming of these plugs would have caused complete failure, and consequently no gas permeability was measured. Finally the sidewall cores were photographed in normal light. No uv-fluorescence was observed and consequently photography in uv-light was not carried out.

Table 2.1. List of rotary sidewall cores from Wessel-1.

SWC no.	Depth in meter	Lithology
2	3141.0	Zechstein dolomite
3	3139.5	-
4	3138.7	-
9	3127.5	-
10	3124.0	-
36	3082.5	Triassic siltstone
37	3077.0	-
38	3073.0	-
40	3057.0	-
41	2775.0	Tor Fm. chalk

3. Flow chart of the analytical procedure



4. Analytical methods

The following is a short description of the methods used by the GEUS Core Laboratory. For a more detailed description of methods, instrumentation and principles of calculation the reader is referred to API recommended practice for core analysis procedure (API RP 40, 1960).

4.3 Conventional cleaning and drying

The sidewall cores are trimmed to a length of 1" - 1.5". The plugs are then placed in a Soxhlet extractor, which continuously soaks and washes the samples with methanol. This process removes water and dissolves salt precipitated in the pore space of the rock. Extraction is terminated when no chloride ions are present in the methanol. Samples containing hydrocarbons are then cleaned in toluene until a clear solution is obtained. Samples are vacuum dried at 90°C or 110°C, or they are humidity dried at 60°C and 40% relative humidity until constant weight occurs, depending on the requirements of the client.

4.4 Gas permeability

The plug is mounted in a Hassler core holder, and a confining pressure of 400 psi is applied to the sleeve. The specific permeability to gas is measured by flowing nitrogen gas through a plug of known dimensions at differential pressures between 0 and 1 bar. No back pressure is applied. The readings of the digital gas permeameter are checked regularly by routine measurement of permeable steel reference plugs.

4.6 He-porosity and grain density

The porosity is measured on cleaned and dried samples. The porosity is determined by subtraction of the measured grain volume and the measured bulk volume. The Helium technique, employing Boyle's Law, is used for grain volume determination, applying a double chambered Helium porosimeter with digital readout, whereas bulk volume is measured by submersion of the plug in a mercury bath using Archimedes principle. Grain density is calculated from the grain volume measurement and the weight of the cleaned and dried sample.

4.8 Precision of analytical data

The table below gives the precision (= reproducibility) at the 68% level of confidence (+/- 1 standard deviation) for routine core analysis measurements performed at the GEUS Core Laboratory.

Measurement	Range, mD	Precision
Grain density		0.003 g/cc
Porosity		0.1 porosity-%
Gas Permeability	0.001-0.01	25%
	0.01-0.1	15%
	> 0.1	4%

5. Results of conventional core analysis

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND

GEUS CORE LABORATORY

CORE ANALYSIS TABULATION

FINAL REPORT

Compiled by Niels Springer

WELL : Wessel-1

Sidewall Cores

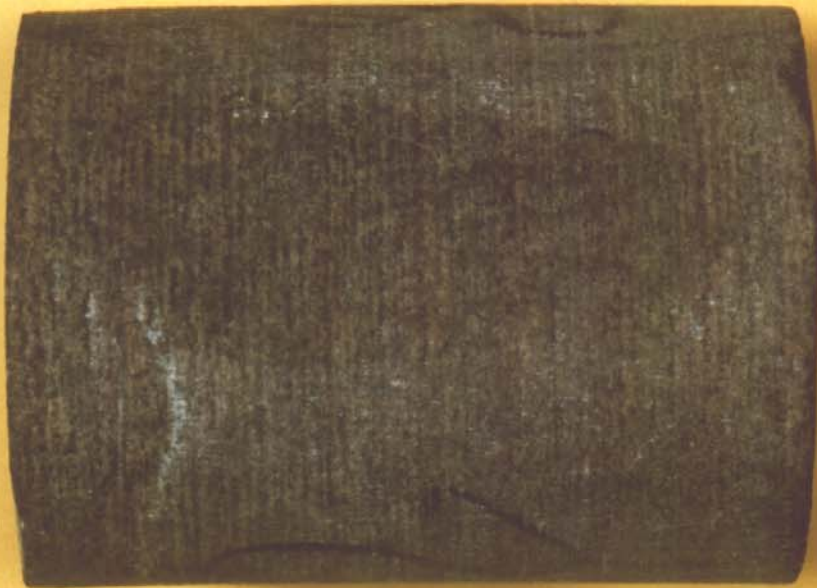
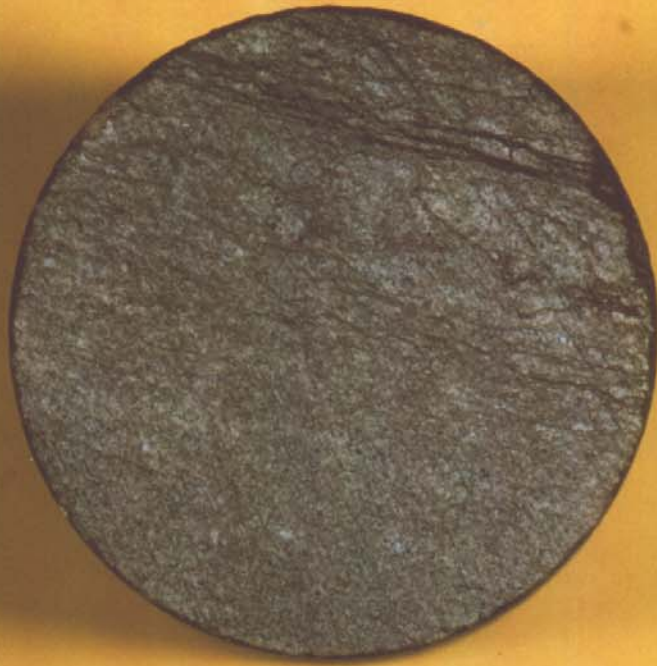
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SAMPLE NO.	DEPTH METER	PLUG TYPE	GAS PERM mD	POROSITY %	GRAIN DENS. G/CCM	COMMENT
2	3141.00	MISC	0.009	1.14	2.775	Zechstein dolomite
3	3139.50	MISC	0.016	2.09	2.807	-"- -"
4	3138.70	MISC	0.007	0.33	2.850	-"- -"
9	3127.50	MISC	0.501	18.30	2.802	-"- -"
10	3124.00	MISC	0.730	20.88	2.795	-"- -"
36	3082.50	MISC		16.14	2.768	Triassic siltstone
37	3077.00	MISC		17.87	2.731	-"- -"
38	3073.00	MISC		15.07	2.779	-"- -"
40	3057.00	MISC		15.34	2.702	-"- -"
41	2775.00	MISC	2.04	19.11	2.704	Tor Fm chalk

6. Plug photos

The diameter of the sidewall cores are approx. 23 mm.

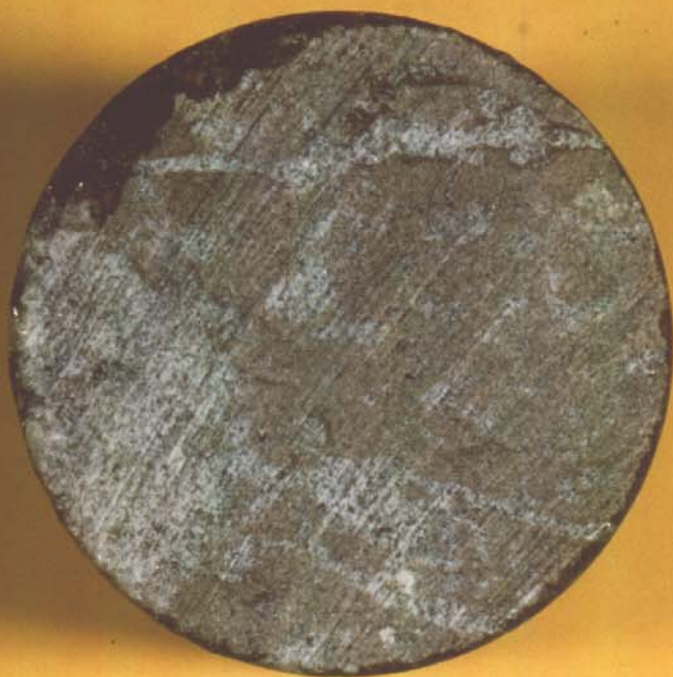
Wessel- / SWC 2 / 3141.0 m



Wessel -1/ SWC 3 / 3139.5 m



Wessel -1/ SWC 4 / 3138.7 m



Wessel -1/ SWC 9 / 327.5 m



Wessel -1/ SWC 10 / 3124.0 m



Wessel -1/ SWC 36 / 3082.5 m



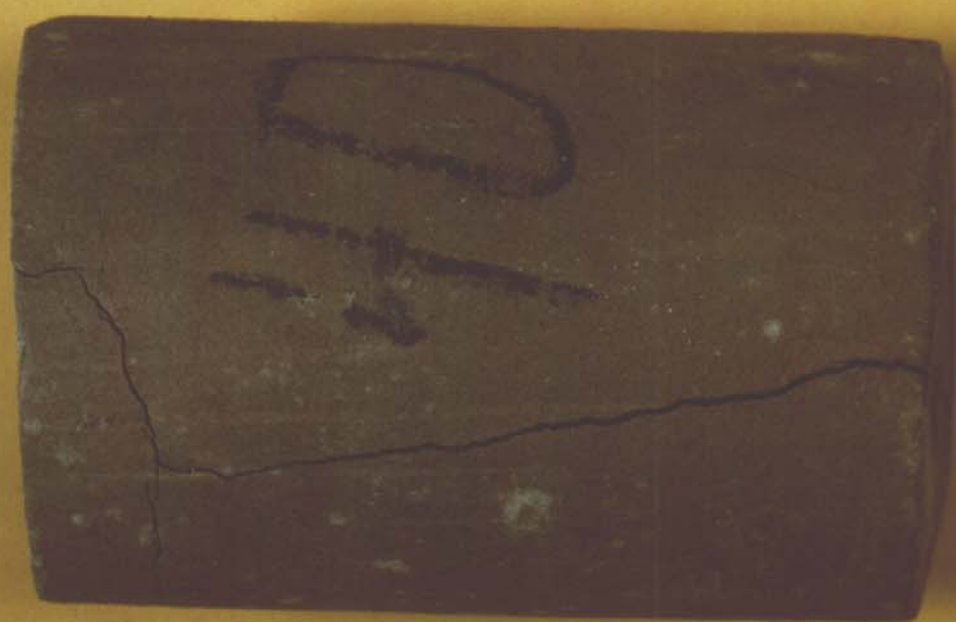
Wessel -1/ SWC 37/ 3077.0 m



Wessel -1/ SWC 38 / 3073.0 m



Wessel -1/ SWC 40 / 3057.0 m



Wessel -1/ SWC 41 / 2775.0 m

