Lecture Four

Formation Evaluation

Petroleum & Mining Engineering Collage

Reservoir Engineering Department / Third Year

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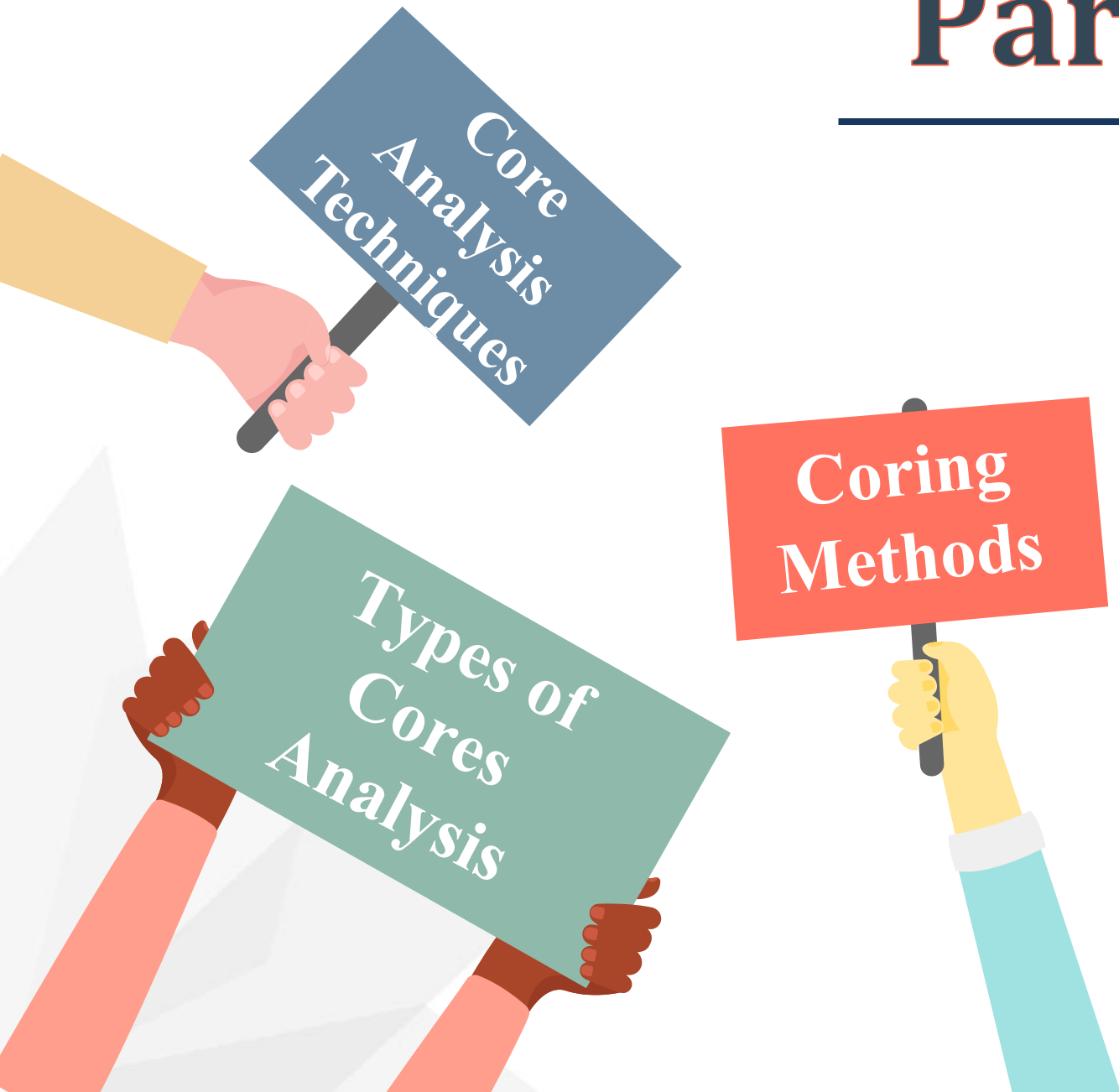
Part One



Coring and Core Analysis

Introduction

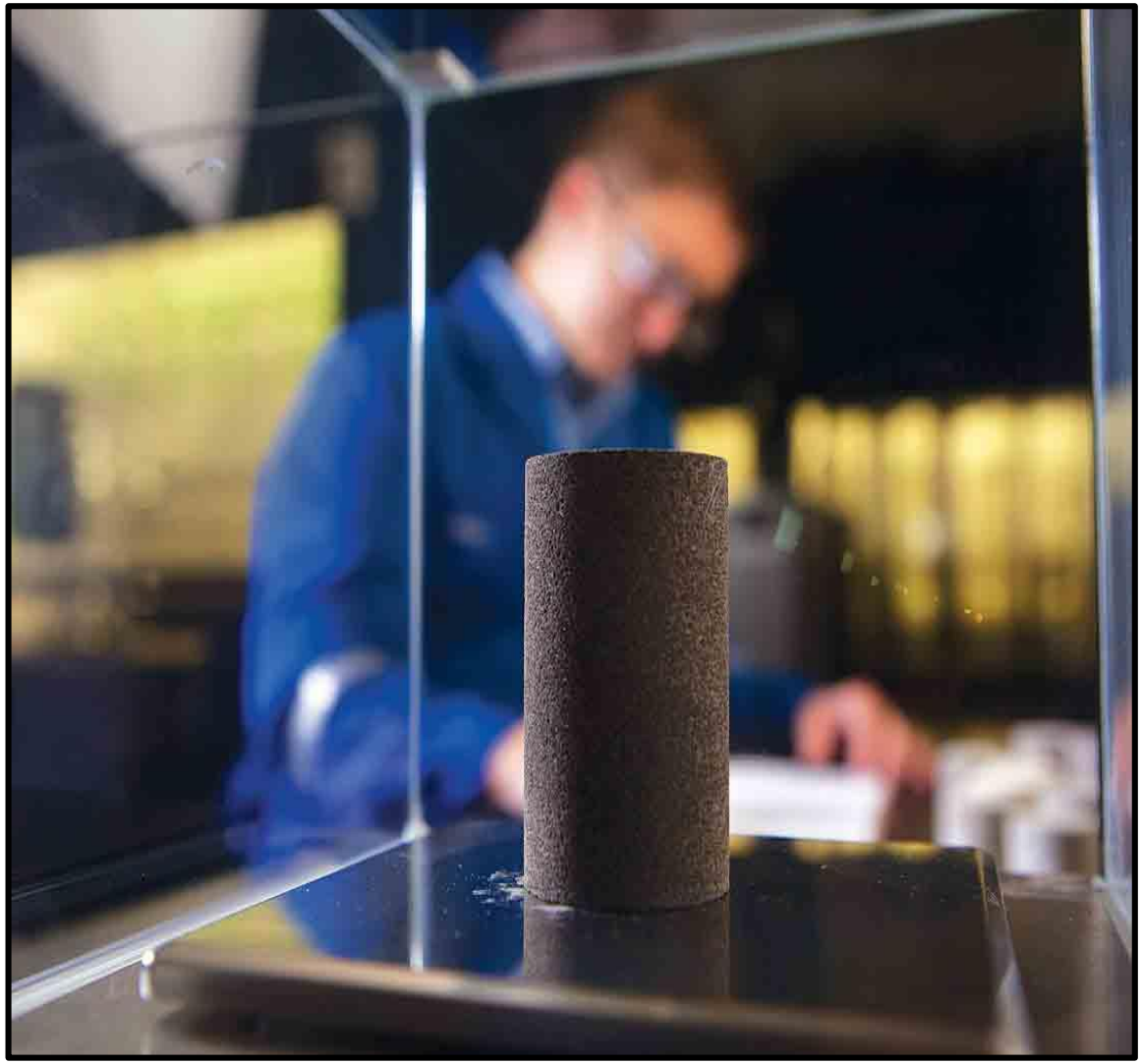
Coring is the removal of undamaged sample formation material from a wellbore and brought to the surface for physical examination.

The Objectives of Coring:

- ☑ Bring a sample of the formation and its pore fluids to the surface in an unaltered state
- ☑ Preserve the sample
- ☑ Transport it to a laboratory for analysis.

The Objectives of Core Analysis:

Reduce uncertainty in reservoir evaluation by providing data representative of the reservoir at in situ conditions



Core information include:

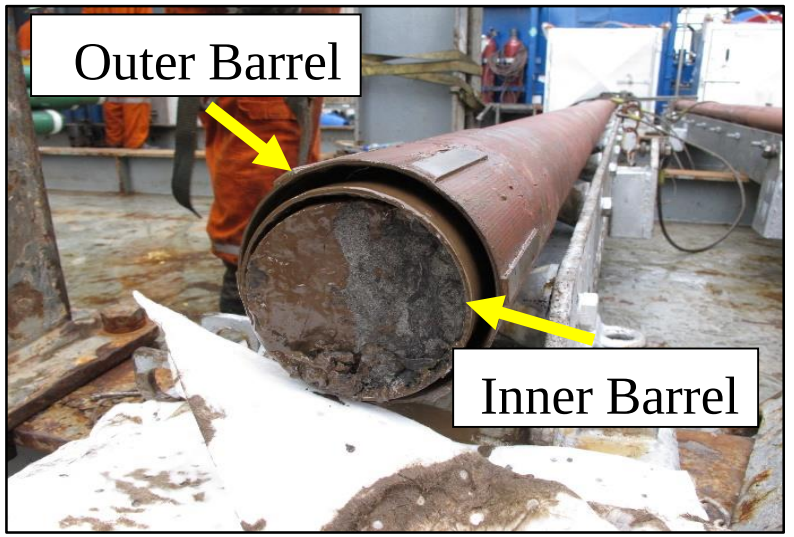
- Geological Evaluations
- Engineering Evaluations

Part Two

Coring and Core Analysis

1- Coring Methods

Generally, current methods of coring can be grouped into ***conventional and sidewall coring***



1. Conventional Coring:

A core bit is located on extreme end of the drill stem and a core barrel is located immediately above the core bit for retaining the core after the cut.

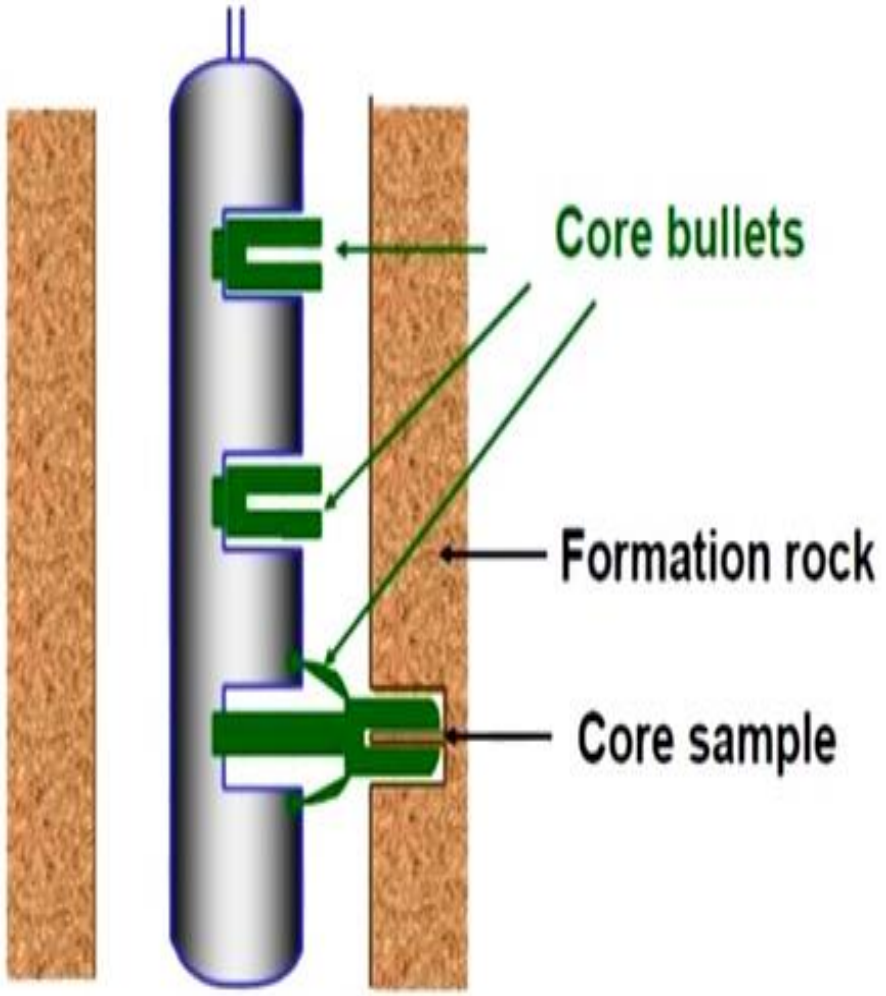
Drilling fluid circulates between the inner and outer barrels in order not to flush the core.

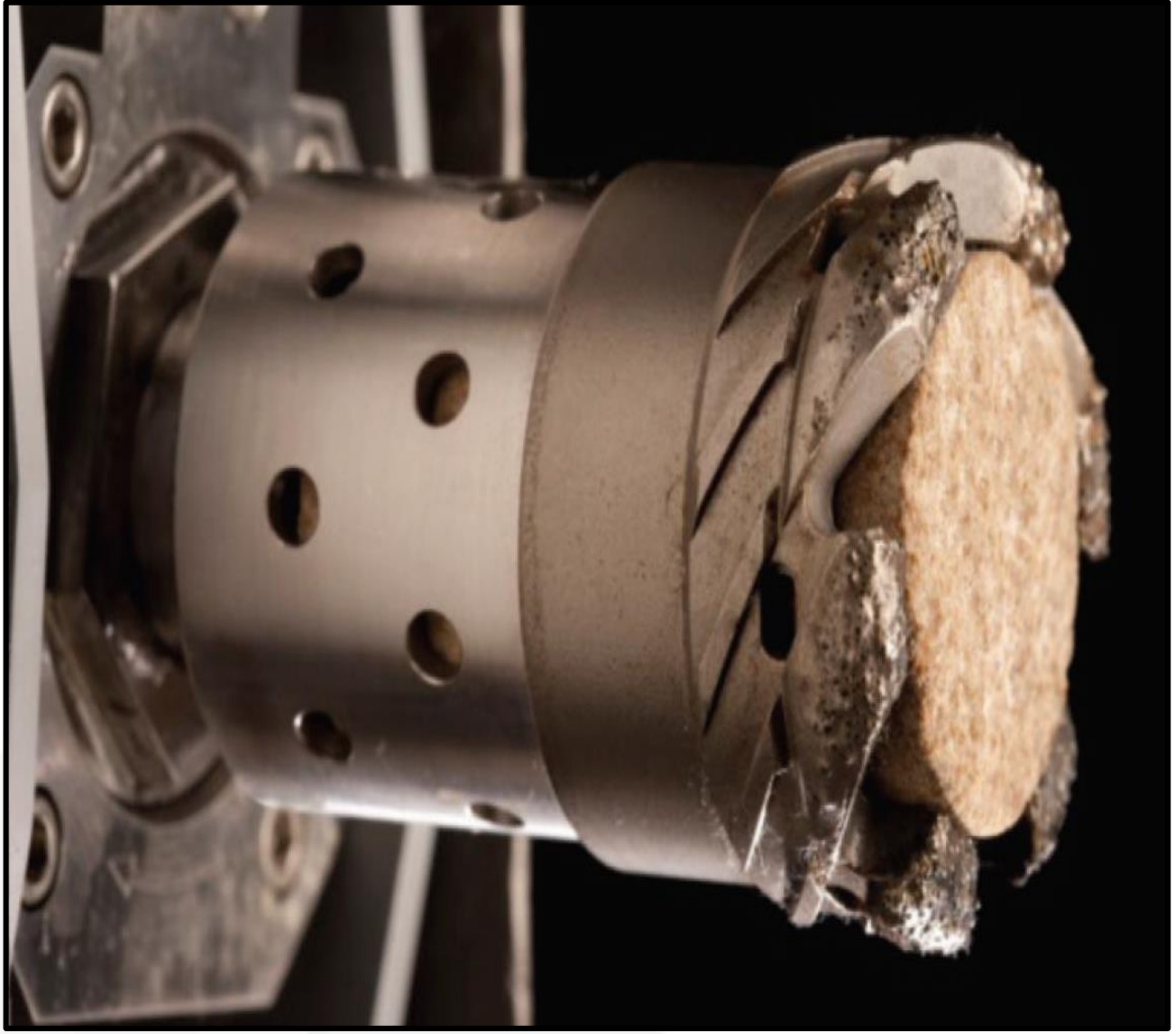
2- Sidewall Coring:

In sidewall coring, a sample is obtained from the wall of a previously drilled open hole at chosen depths

Advantages of This Method

- Samples can be obtained from zones that were not cored at the time of initial penetration
- These samples can be taken at very precise positions in the hole.





sidewall coring

Conventional Coring

Part Three

Coring and Core Analysis

2- Core Analysis Techniques:

The technique used depends all *the coring method, the type of rock to be analyzed, and the type of data to be obtained.*

(1) Conventional or Plug Analysis:

The plug analysis method is used most frequently. In this method, a small plug sample, which is easy to work within the laboratory, is cut at selected intervals from the whole core.

(2) Whole-Core Analysis:

The whole-core analysis method is used ***when the plug analysis method becomes invalid because the heterogeneities such as fractures or vugs.***

The technique requires larger equipment in the laboratory, and not all commercial laboratories are equipped to perform this type of analysis.

(3) Sidewall Core Analysis

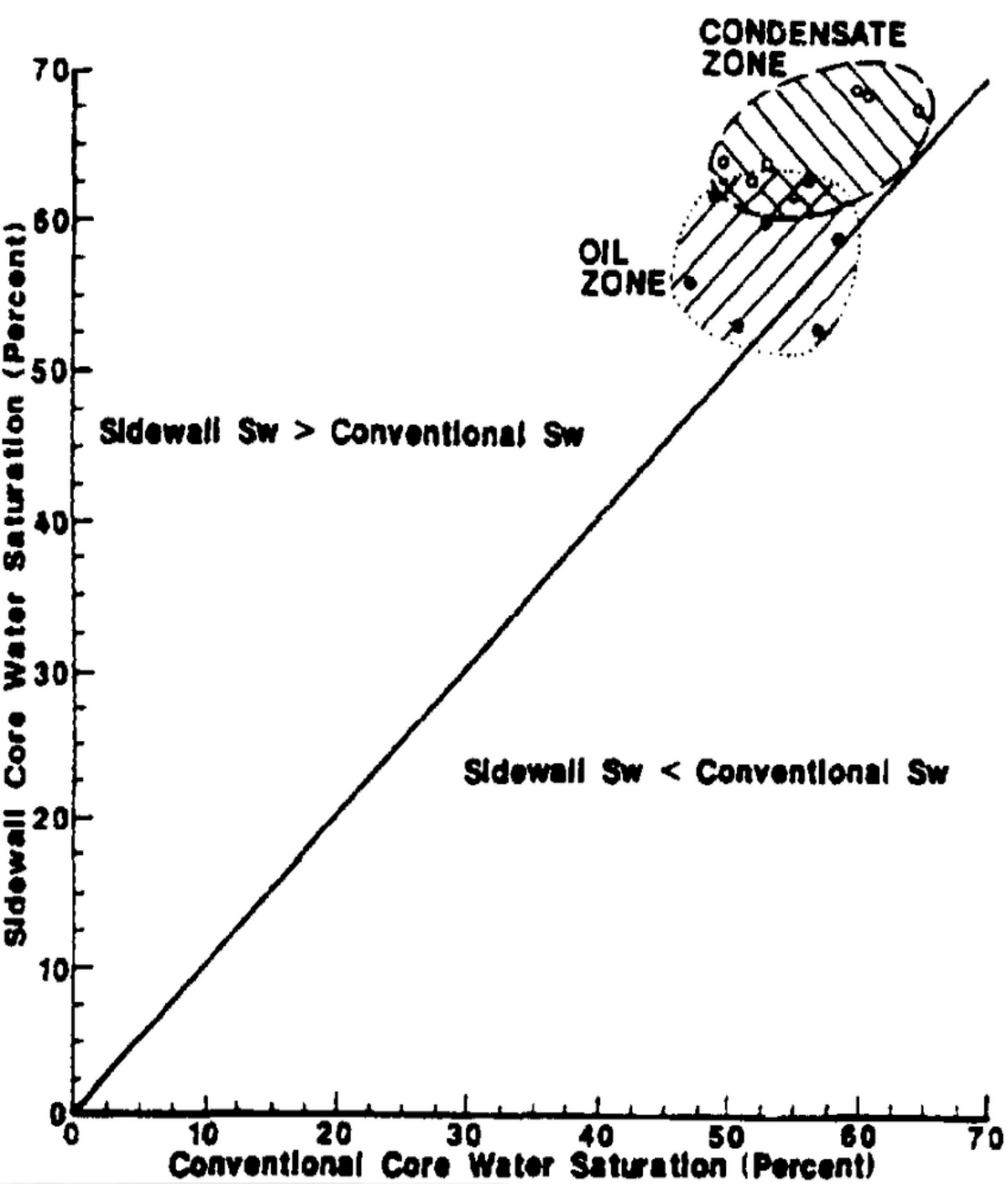
Considering the process under which these cores are obtained and the sample size of the core, the measured data ***will have limited value in some areas*** in addition to the in some situations, ***this rock sample is all that is available***.

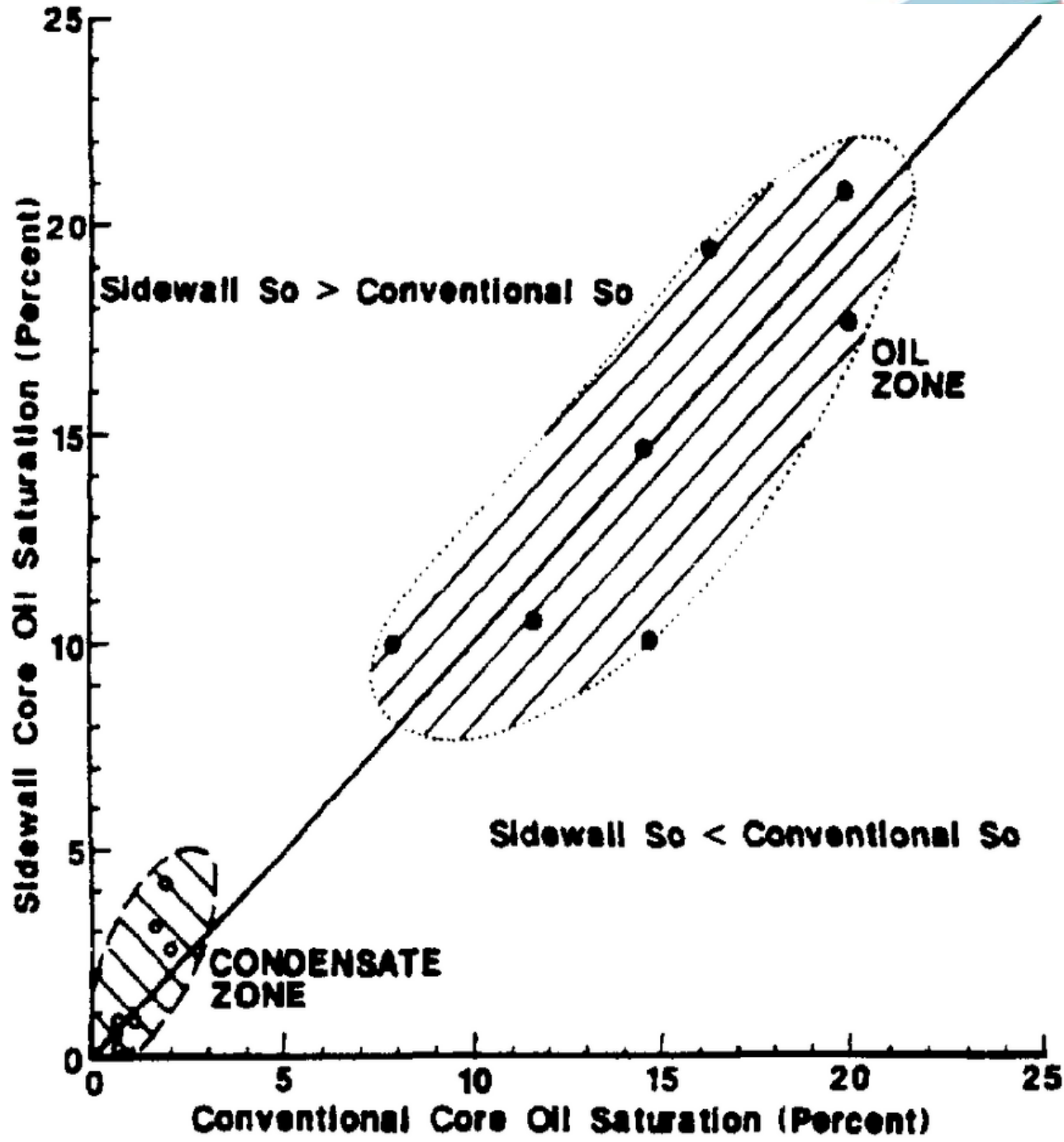
Therefore, desirable to look at the relative value of rock properties as determined from sidewall samples and those obtained from conventional cores.

What are the rock properties values that are determined from sidewall samples and those obtained from conventional cores?

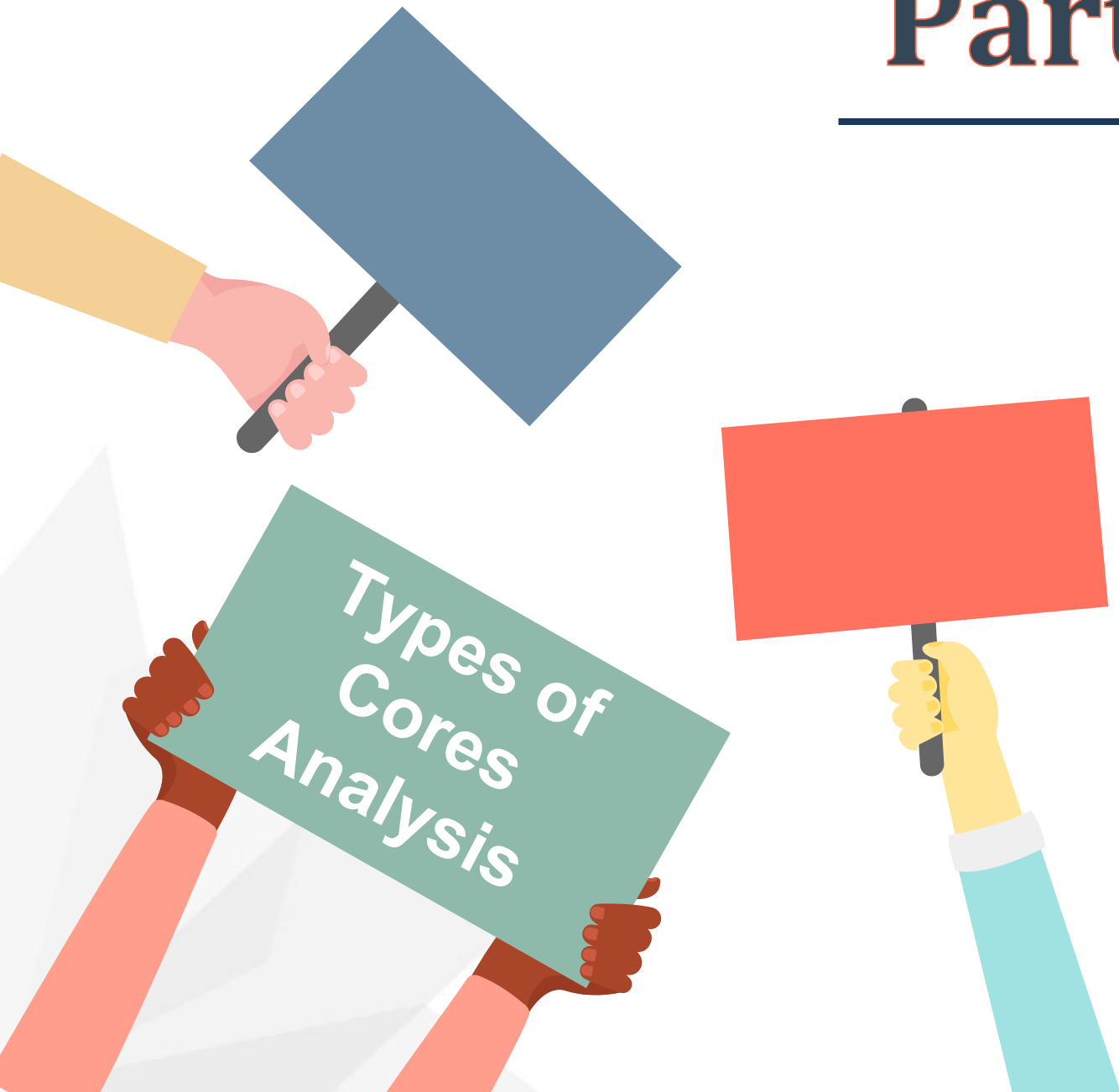
indicate to:

- Sample porosities in softer, looser sands are only slightly higher than those of conventional cores.
- Sidewall sample permeability is decreased in higher permeability formations.
- Water saturations from the sidewall cores are higher and oil saturations slightly higher or lowe than conventional core data according to API value.


CONDENSATE ZONE
OIL ZONE
Sidewall Sw > Conventional Sw
Sidewall Sw < Conventional Sw
Sidewall Core Water Saturation (Percent)
Conventional Core Water Saturation (Percent)
0
10
20
30
40
50
60
70


Sidewall So > Conventional So
OIL ZONE
Sidewall So < Conventional So
CONDENSATE ZONE
Sidewall Core Oil Saturation (Percent)
Conventional Core Oil Saturation (Percent)
0
5
10
15
20
25

Part Four



Coring and Core Analysis

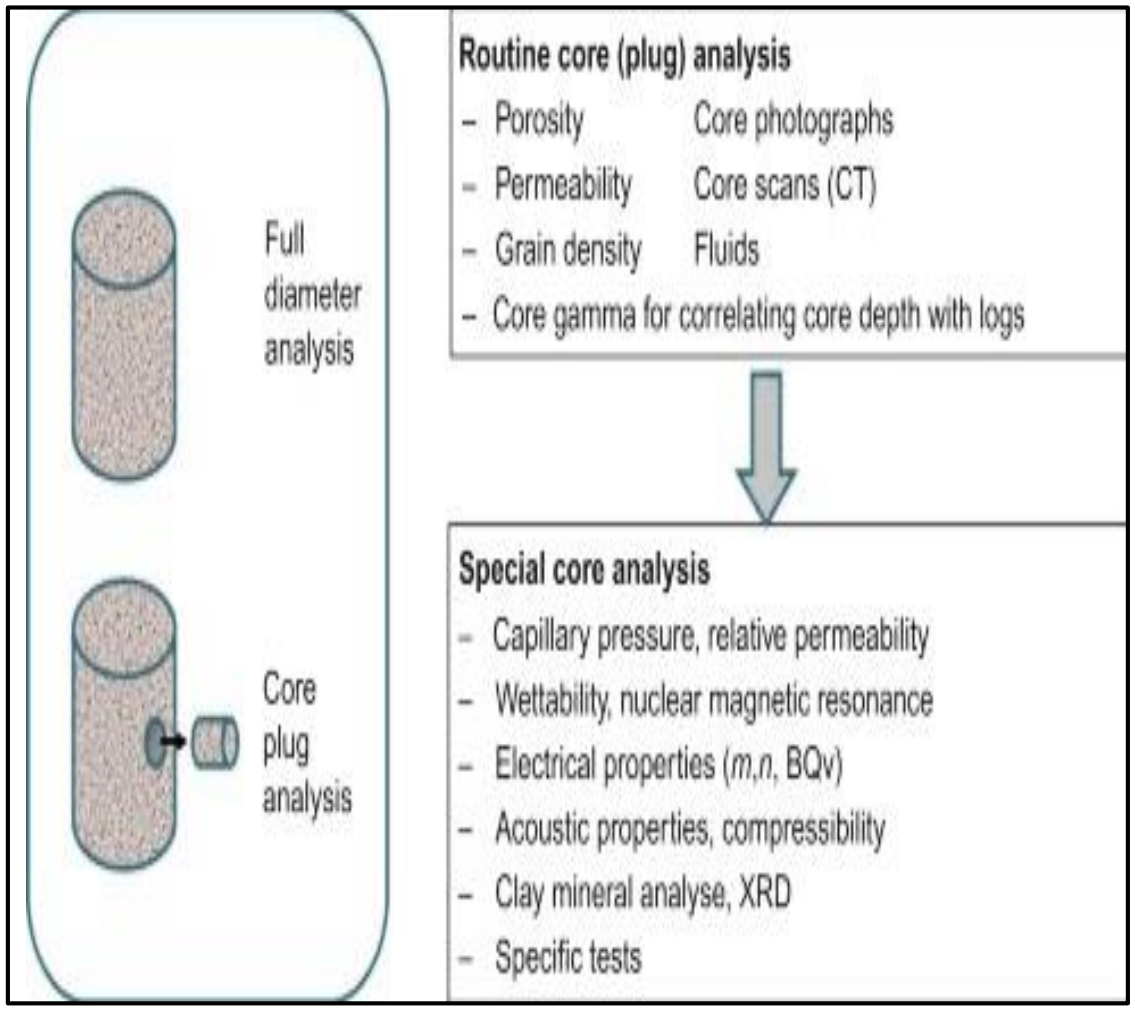
3-Types of Cores Analysis

1- Routine Core Analysis (RCAL)

Basic rock dimensions, core porosity, grain density, gas permeability, and water saturation

2- Special Core Analysis (SCAL)

It extends the data provided by routine measurements to situations more representative of reservoir conditions. SCAL data is used to support log and well test. However, SCAL measurements are more expensive.



Thank You