

I need to know

An Introduction to the Oil Industry & OPEC



I need to know

AN INTRODUCTION TO THE OIL INDUSTRY & OPEC

OPEC Secretariat
Public Relations & Information Department

All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means without the prior permission in writing of the OPEC Secretariat, or as expressly permitted by law, or under terms agreed with the appropriate reprographics rights organization. Enquiries should be addressed to the Head of PR and Information Department, OPEC, Helfferstorferstrasse 17, Vienna 1010.

© Organization of the Petroleum Exporting Countries, 2011

ISBN 978-3-200-02193-8

Designed and illustrated by Michael Haderer, Vienna, Austria

The designation of geographical entities in this book, and the use and presentation of data and other materials, do not imply the expression of any opinion whatsoever on the part of the Organization of the Petroleum Exporting Countries (OPEC) and/or its Member Countries concerning the legal status of any country, territory or area, or of its authorities, or concerning the exploration, exploitation, refining and utilization of its petroleum or other energy resources.

Printed by Ueberreuter Print GmbH, 2100 Korneuburg, Austria

This book
is dedicated
to children and
all young people
around the
world.

Table of Contents

Foreword	09
Introduction	10

Chapter 1

OIL BASICS 12–25

What is crude oil?	12
What is petroleum?	12
How is oil formed?	15
Oil properties.....	18
<i>Light / Heavy</i>	18
<i>Sour / Sweet</i>	18
Reference crude oil	19
A brief history of the industry	20
Why is oil important?.....	22
How much oil does the world need?	24

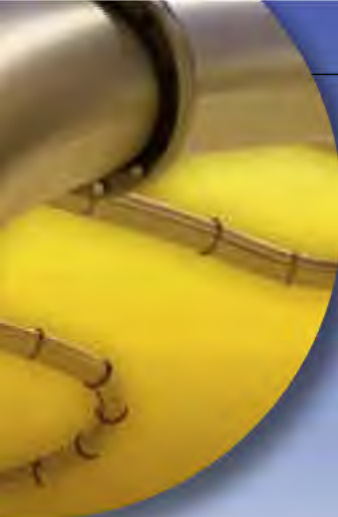
Chapter 2

FINDING OIL (UPSTREAM) 26–35

A big adventure begins!	27
So how do we find oil	27
Upstream.....	27
<i>Exploration</i>	28
<i>Production</i>	30
<i>Onshore</i>	31
<i>Offshore</i>	32
Huge investments are required	34

Hello! My name is
Prof. Riggs and I
will guide you through this
exciting book.





Chapter 3

REFINING OIL (DOWNSTREAM)..... 36-47

The adventure continues!	36
Downstream	36
Refining	37
Separation	38
Conversion	40
Treatment	41
Transportation	42
Pipelines	43
Roads and railway	44
Ocean tankers	46



Chapter 4

ABOUT OPEC 48-63

Introduction	50
Birth of OPEC	52
The OPEC logo	52
Who are the members of OPEC?	56
Founder Members	56
Full Members	56
Associate Members	56
Table OPEC Member Countries	57
Who can be a Member?	58
OPEC's mission	59
Stabilizing oil markets	59
Keeping the market supplied	59
Organizational structure	60
The Conference	60
Board of Governors	60
Economic Commission Board	60
The Secretariat	61
The OPEC Summit.....	61
Building bridges	62
How does OPEC help other countries?	63
What is OFID?	63
Glossary of Terms	64
Bibliography & Resources	66



Foreword

There is a first time for everything. This illustrated student's guide to the oil industry is certainly an exciting first for OPEC. Similarly, preparing an introduction for it is a first for me. But it is a task of great importance.

This book is not only about an industry that is central to the way we live today—and to the creation of economic opportunities around the world—it addresses people who will become the business and political leaders of tomorrow.

Whether they live in oil consuming or producing countries like OPEC's own Member Countries, the words in this book are directed at young people everywhere. The challenges of our world will someday be yours; and the more you know and understand about the world's most important energy source—oil—the better prepared you will be to respond to the challenges of the future.

Learning about the history of OPEC and its growing role in the international community is also important. In many ways, the story of OPEC is the modern history of oil. Since its founding in 1960, OPEC has consistently sought to bring stability to the oil market. It has also tried to help others understand the workings of the oil industry, the activities of its Member Countries and many other aspects of a global industry.

Now, 50 years later, OPEC continues to look for opportunities to further understanding, especially among the world's young people.

I sincerely hope you will enjoy this book. It aims to make learning about the oil industry—and OPEC's role in it—interesting.

It is with great pride that we present this book. It is my hope that after reading it, the oil industry will start to become as compelling to you as it has been for me, and the many men and women who have worked in it for many, many years.

Abdalla Salem El-Badri
Secretary General



Introduction

I need to know: An Introduction to the Oil Industry and OPEC tells the story of oil. It tells how crude oil—or, using its more technical term, petroleum—was discovered, how it is explored and taken from the ground and made into other products. Over the last 150 years, oil has had many benefits and applications in our world—in industries, in medicine, at home and in transportation. It has shaped our world in many important ways.

Although talking about oil and its production may sound complicated, this book is meant to simplify it. It is a book that both young people and adults can enjoy. It has been written so that novices can learn something about the origins of oil and the basics of the oil industry. Thus, the language used has been kept as non-technical as possible and the illustrations help to break down the complex nature of the topic.

While this book is conceived as a history of oil, the reader will also be able to learn about the Organization of the Petroleum Exporting Countries (OPEC), which celebrated its fiftieth anniversary in 2010.

There is no doubt that turning fifty years old is a milestone. When OPEC was founded, few could have predicted that it would have lasted as long as it has. More than that, it has since developed into an important global actor. In fact, the slogan for OPEC's Golden Jubilee year—"supporting stability, fuelling prosperity"—captures the essence of OPEC's activities over the last fifty years, and reflects the work it has done in contributing to global economic growth.

The book tries to raise awareness of the Organization's important role in ensuring a regular and adequate supply of oil to the global markets. It also provides a summary of the founding of the Organization in 1960, explains its membership and structure, and considers some of the frequently asked questions that people have about OPEC.

As OPEC's Secretary General, Abdalla S. El-Badri, has noted in the past, "OPEC is the oldest surviving inter-governmental organization composed wholly of developing countries." This is an admirable achievement, especially considering that it has survived a lot of challenges in the past.

“OPEC is the oldest surviving inter-governmental organization composed wholly of developing countries.”

Secretary General, Abdalla S. El-Badri, OPEC

The book is divided into four chapters. **Chapter I** provides a brief history of the oil industry and highlights key facts about petroleum. This includes the origins of the word ‘petroleum’ and the definition of crude oil. It provides summary explanations about how crude oil was formed and why investments are so important for its ongoing development.

Chapter II describes how oil is found. It considers the investments that are needed for exploration projects and examines how much oil is needed around the world.

Chapter III then focuses on how oil is extracted, brought to the market and refined into useful products. It identifies and explains the differences between the ‘upstream’ and the ‘downstream’ sectors of the industry. A description of the different ways of exploring for oil, as well as the various methods used to transport it, are also explained.

Finally, **Chapter IV** provides an overview of the history of OPEC, explaining the background and the circumstances that led to its founding and the requirements for membership. There is also a brief description of the Organization’s overall mission and objectives, and an explanation of the Secretariat’s organizational structure. The commitment of OPEC Member Countries to assisting developing countries, which they pursue through the OPEC Fund for International Development (OFID), is also described.

It is our hope that whoever reads this book will be able to better understand OPEC’s vital role in the global economy and the challenges it faces. As it enters its sixth decade, OPEC is well prepared to meet these new challenges.

Oil Basics

WHAT IS CRUDE OIL?

Crude oil is an organic liquid substance often found below the Earth's surface. It is made up of thousands of molecules composed of different hydrogen and carbon atoms. Such compounds are called *hydrocarbons*.

These hydrocarbons also contain different proportions of impurities like oxygen, sulphur, nitrogen and heavy metal atoms.

WHAT IS PETROLEUM?

The word 'petroleum' is derived from the Latin *petra* (which means rock) and *oleum* (which means oil). It is commonly used to refer to crude oil, but it may also refer to other related hydrocarbons.

Some hydrocarbons are gaseous, rather than liquid. Methane is the most common example of these hydrocarbon gases.

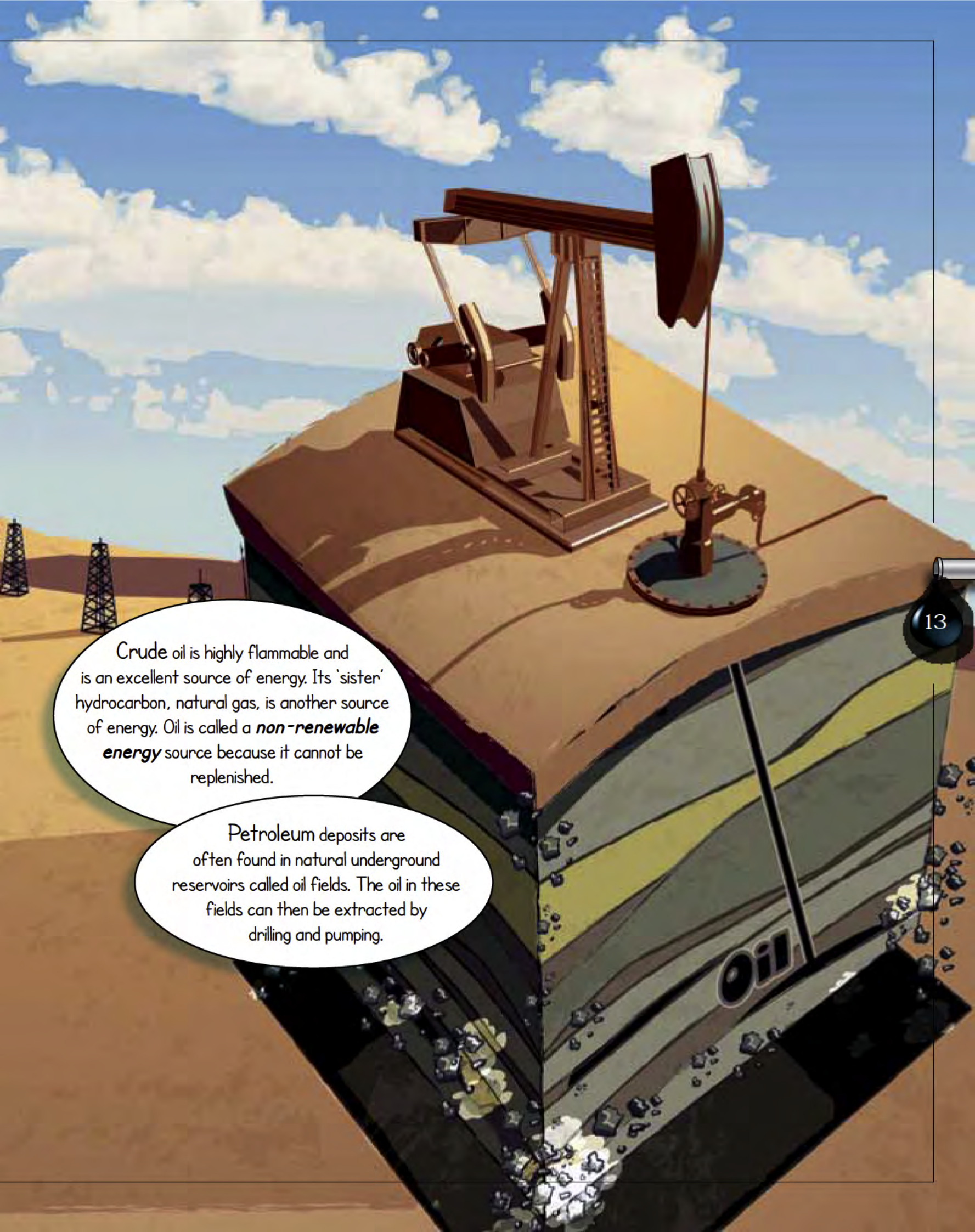
This is the kind of natural gas that we most often use in our kitchens at home.

Hydrogen Atom

Hydrogen Atom

Carbon Atom





Crude oil is highly flammable and is an excellent source of energy. Its 'sister' hydrocarbon, natural gas, is another source of energy. Oil is called a ***non-renewable energy*** source because it cannot be replenished.

Petroleum deposits are often found in natural underground reservoirs called oil fields. The oil in these fields can then be extracted by drilling and pumping.

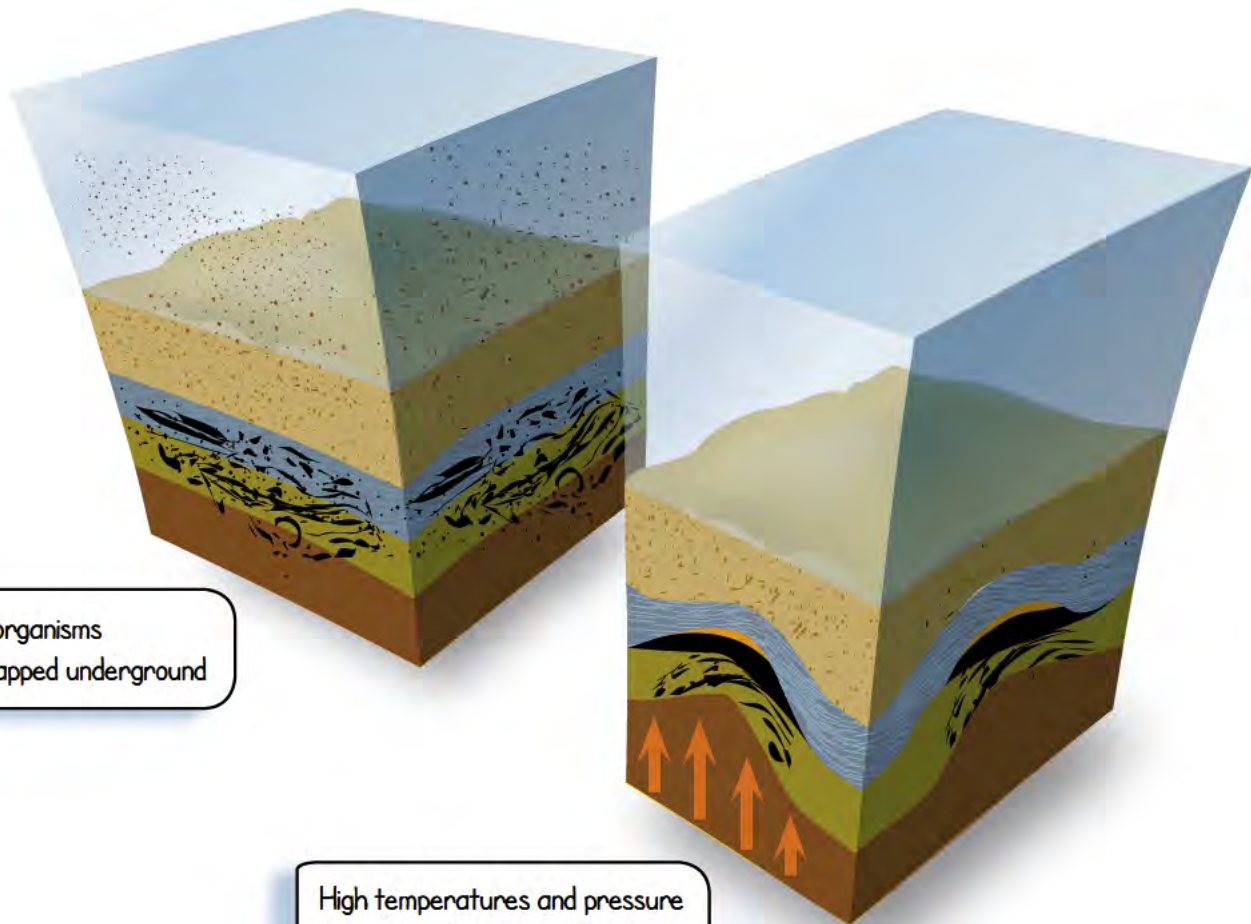
Paleozoic Era
245 to 544 million years ago.



How is oil formed?

Oil is formed from the accumulation of hydrocarbons. Hydrocarbons accumulate naturally, thousands of feet below the surface of the Earth, from the decomposition of organic materials like plants and marine animals which died during the Palaeozoic Era (between 245 and 544 million years ago).

Trapped beneath the ground under enormous pressure and high temperatures, these hydrocarbons were compressed and eventually transformed into crude oil after millions of years.



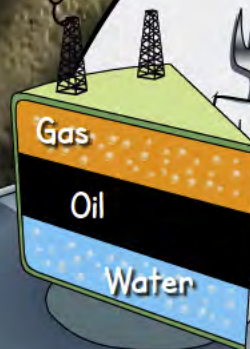
Underground oil accumulations are formed when three conditions are met.

FIRST,

there must be a 'source' rock rich in hydrocarbons and buried deep enough so that the heat from the Earth's core can 'cook' them into oil.

Three-Layer-Cake

Underground Oil Accumulation



SECOND,

there should be a porous rock nearby in which oil can accumulate (it is often sandstone). If the holes in the rock are interconnected, then oil can flow easily out of the rock. This condition is called **permeability**. The porous rock must have good permeability, which is why studying the structure of rocks is an important step to finding oil.

THIRD,

there is usually a 'cap rock' or seal to trap the oil in the underground reservoirs and prevent it from seeping to the surface. Within these reservoirs, hydrocarbons are typically organized like a three-layer cake—with a layer of water below the oil and a layer of gas above it.

Much of the oil that escapes to the surface often evaporates into the air. But it can leave behind deposits of residual hydrocarbons called **bitumen**.

Underground
Oil Accumulation

Oil properties

Crude oil properties can vary widely depending on where the oil is found and under what conditions it was formed. Its different physical properties are used to design the right kind of refineries, classify the oil (for example, West Texas Intermediate or Oman) and determine an appropriate price for it.

The properties of oil include its density, called the **API gravity** (named after the American Petroleum Institute), sulphur content, nitrogen content, carbon residue and distillation range.

Each of these properties is important for different reasons. For example, the sulphur content of crude oil is important because it determines the kind of treatment that it will require at a refinery. The higher the sulphur level, the bigger the effect it will have on the environment—and the more corrosive effect it will have on equipment.

API gravity is also important. It is essentially a measure of density. It determines whether a specific type of crude oil has a higher or lower boiling range (or **distillate yields**), which is important for separating and extracting different parts (or **fractions**).

Different oil-producing areas produce different kinds of crude oil. And depending on its mixture of hydrocarbons, crude oil can vary in colour, composition and consistency.



It is quite common to classify crude oil into different types or **grades**. The following classifications are most common.

Light / Heavy

Crude oil can be classified as either **light** or **heavy** depending on its API gravity (or density). Generally, the higher its API gravity, the lower its density.

Oil that is lighter in colour, has a thin consistency and flows easily usually contains less metals and sulphur compounds. It is known as light oil.

Oil that is high in metal and sulphur content is considered low-grade oil. It generally has too much carbon, not enough hydrogen and is more time-consuming to produce and hard to refine. It is known as heavy oil.

Sour / Sweet

Crude oil can also be classified as either **sour** or **sweet**, depending on the amount of sulphur it contains.

Oil with a high sulphur content (0.5% and above, by weight) is considered sour.

Sweet crude oil, on the other hand, has low amounts of these sulphur compounds.

REFERENCE CRUDE OIL Some common crude oil types are used as a reference or **benchmark** to determine the value of other crude oils. Some of these reference crude oils are:



Brent Blend

A blend of several crude oils from fields in the North Sea region, located above Germany and the United Kingdom. The price of oil produced in Africa, Europe and the Middle East tends to be based on this oil.

Dubai-Oman

Used as a benchmark for Middle East sour crude oil flowing to the Asia-Pacific region.

Tapis Crude

Oil produced in Malaysia that is used as a reference for light oil from East Asia.

West Texas Intermediate (WTI)

A very high-quality, sweet, light oil produced in North America.

A brief history of the industry

The world's first oil wells were drilled in China around the 4th century AD. The Chinese used simple bamboo poles to drill these wells. The dark, sticky material they extracted was then used primarily as a source of fuel.

In later centuries, oil was found across Asia and Europe. Sometimes it accumulates in natural pools above the ground. Travellers and settlers used the mysterious black liquid for fuel, as well as for medical treatment.

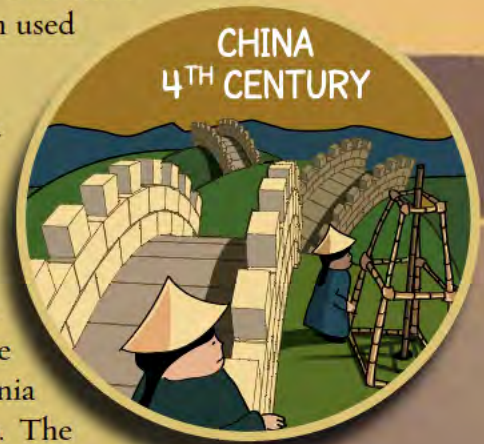
The modern oil industry began in the mid-19th century. On August 27, 1859, Colonel Edwin Drake discovered the first underground oil reservoir near Titusville, Pennsylvania (USA), after drilling a well only 21 metres (69 feet) deep. The oil flowed easily. It was also easy to work with and distil. This oil was known as a paraffin type of oil.

Drake worked for the Pennsylvania Rock Oil Company which wanted to use the oil to light street lamps. Drake's well initially produced 30 barrels of oil per day (b/d). (One barrel is equal to 159 litres or 42 US gallons). Its success marked the beginning of the modern oil industry.

Oil soon began to receive more attention from the scientific community. After some research, a variety of products were eventually developed from crude oil. For example, kerosene for heating was one of the first products.

Soon other products (like gasoline and diesel to run engines) were also on the market. In 1890, the mass production of automobiles began creating a huge demand for gasoline and pushing companies to find more oil fields.

CHINA
4TH CENTURY



1918

WARMTH
FOR
EVERYBODY



SAVE THE NATIONAL COAL WITH
OIL HEATERS

1918

WARMTH
FOR
EVERYBODY



SAVE THE NATIONAL COAL WITH
OIL HEATERS



Why is oil important?

Crude oil is a central part of modern life and the world's most important energy resource. We rely on it in many ways for the food we eat, the clothes we wear and the electronics we use at home and in the workplace. Without oil, we would not be able to continue to enjoy the same standard of living.



The way people live, work and travel all depend on oil. Oil is, in fact, the world's most important transportation fuel. About 90% of all transportation fuels come from crude oil.



Jet fuel

It is also the raw material from which other important products are made, which have improved the quality of our lives over the past century and a half. It has been used to keep people's houses warm during the winter for centuries.



Aspirin

Artificial heart

Shampoo

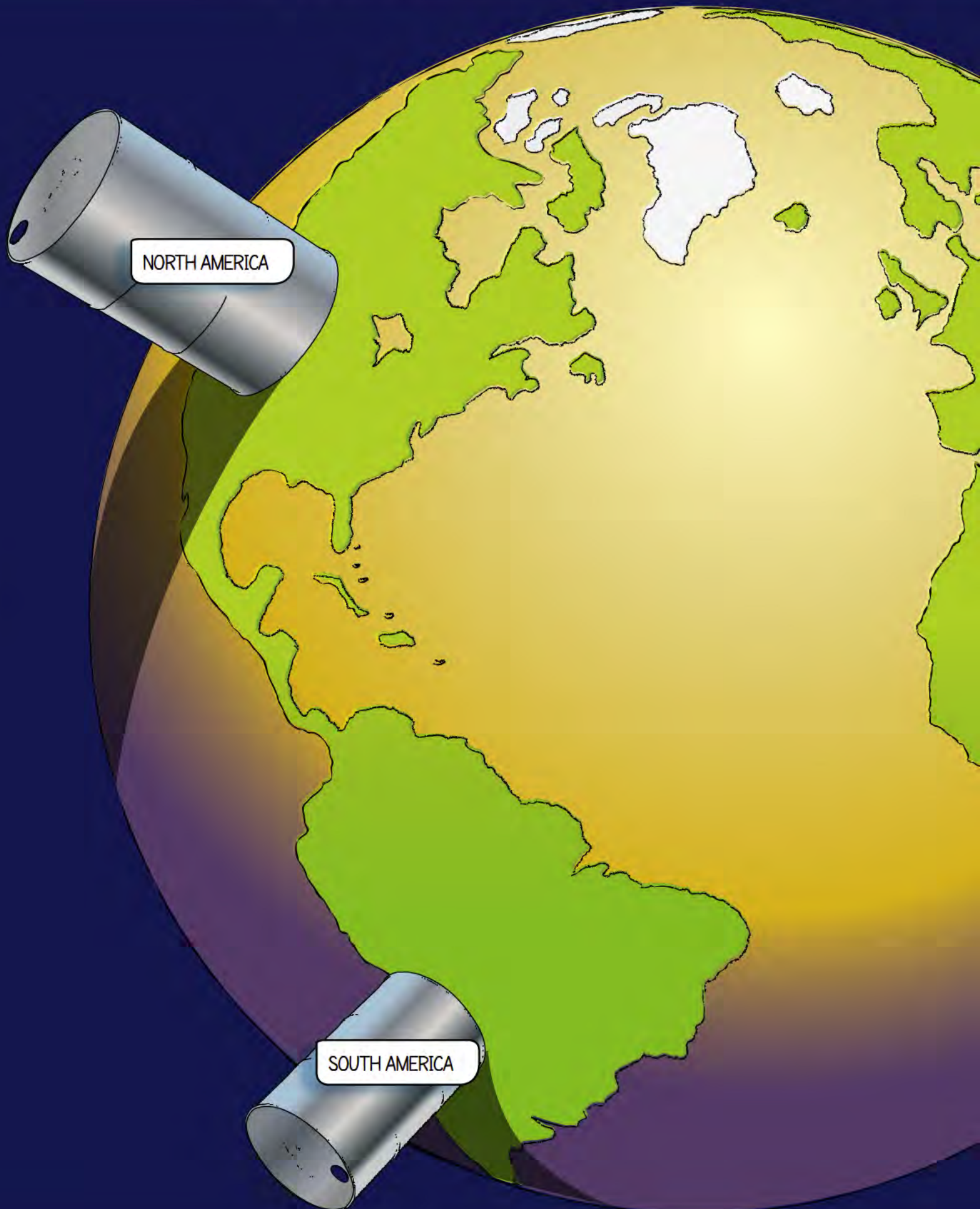
Synthetic fibres

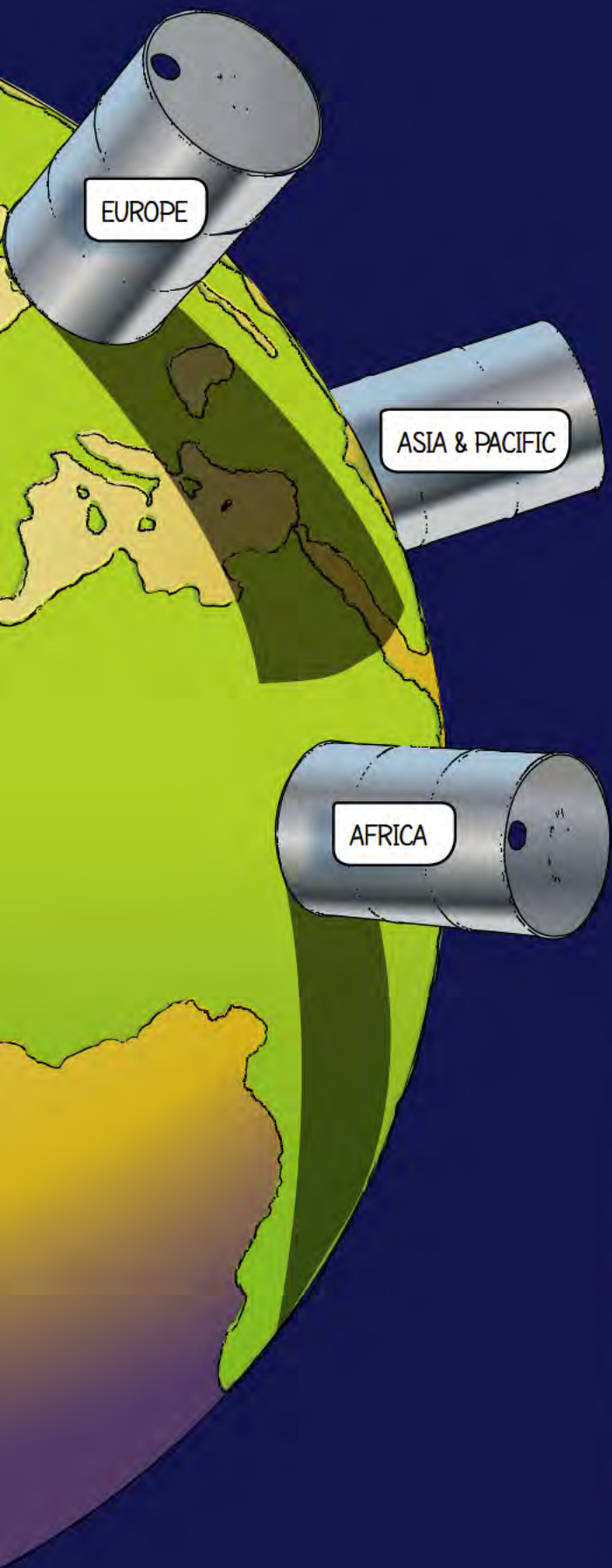
Lipstick

But oil is also used to make medicines, plastics and cleaning products. In fact, modern life as we know it today would be impossible without oil and its products. Many of the everyday items people use are either made from oil or are dependent on oil for their production.

Some of these products include heating oil, jet fuel, kerosene, dentures, diapers, fertilizers, lipstick, shampoo, deodorant, shaving cream, crayons, musical devices, cameras, computers, glue, contact lenses, toothpaste, synthetic fibres, tires, artificial hearts and even aspirin.

So now you have an idea of how important oil is in our daily life!





How much Oil does the world need?

The world needs more energy as its population grows and as countries become more economically prosperous.

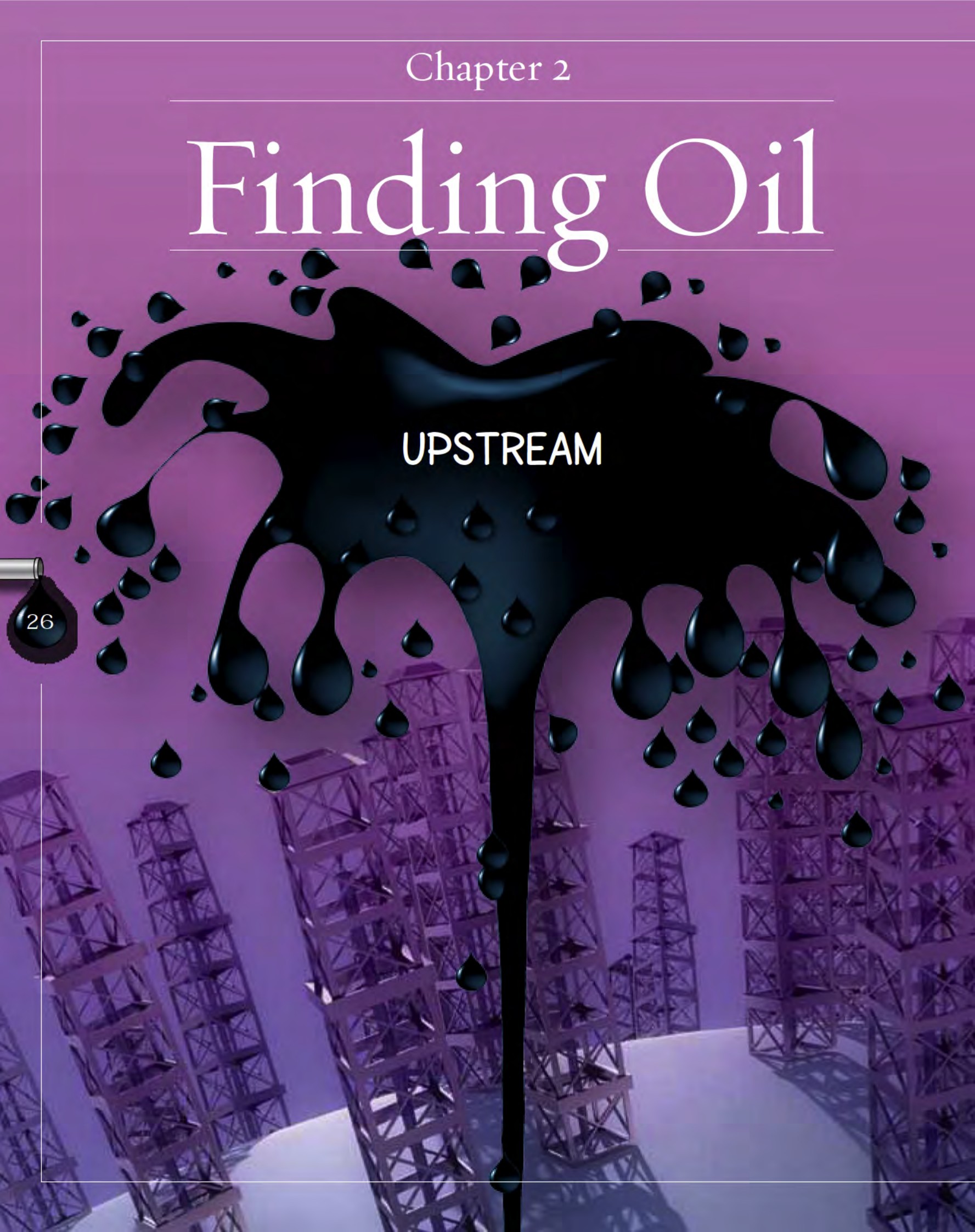
The United States has the world's largest demand for oil. Although it has only about 5% of total world population, it uses nearly 25% of the world's total oil production and 45% of the world's total gasoline production.

And as the economies of countries like Brazil Russia, India and China become richer, and their economies expand, their need for more oil will grow.

To meet all this demand for oil without provoking market imbalances, the right supply levels are needed. Measuring this is always a challenge for the experts who work in the oil industry.

Finding Oil

UPSTREAM



A big adventure begins!

Finding oil and getting it out of the ground is a challenging and exciting activity. It requires great effort and travel to distant lands—and the results can often be surprising.

SO HOW DO WE FIND OIL?

It starts with the simple decision to explore for oil based on preliminary survey data. Once oil is discovered, the initial results are tested. If the results are good, then the development of a production well begins.

Because of the importance of oil in our lives, it is necessary to understand how the industry as a whole works in both its upstream and downstream sectors. For this, it is helpful to look at the oil industry by first considering what is called the *upstream* sector.

UPSTREAM

The upstream sector is the part of the oil industry involved with finding oil fields and bringing oil up from the ground. Upstream activities include exploratory work, such as the search for underground (or underwater) oil and gas reservoirs, and the initial drilling, followed by the production phase, which is the actual extraction of oil from the ground.



Exploration

Exploration is almost like detective work. It requires looking for clues, careful observation of ground conditions, taking notes of different information and the evaluation of survey data. This is the job of petroleum **geoscientists**, who are experts on rocks.

Petroleum geoscientists working at oil companies begin looking for places where there might be oil. They look for signs that may indicate the presence of hydrocarbons underground and are responsible for determining the best places to drill.

They start by examining the shapes of different underground layers of rock. They have to use special tools in order to 'see' the rocks underground. Thus, using advanced technology—and special tools like aerial photography, satellite pictures and specialized machines that measure variations in the Earth's gravity and magnetic fields—geoscientists try to identify likely crude oil fields.

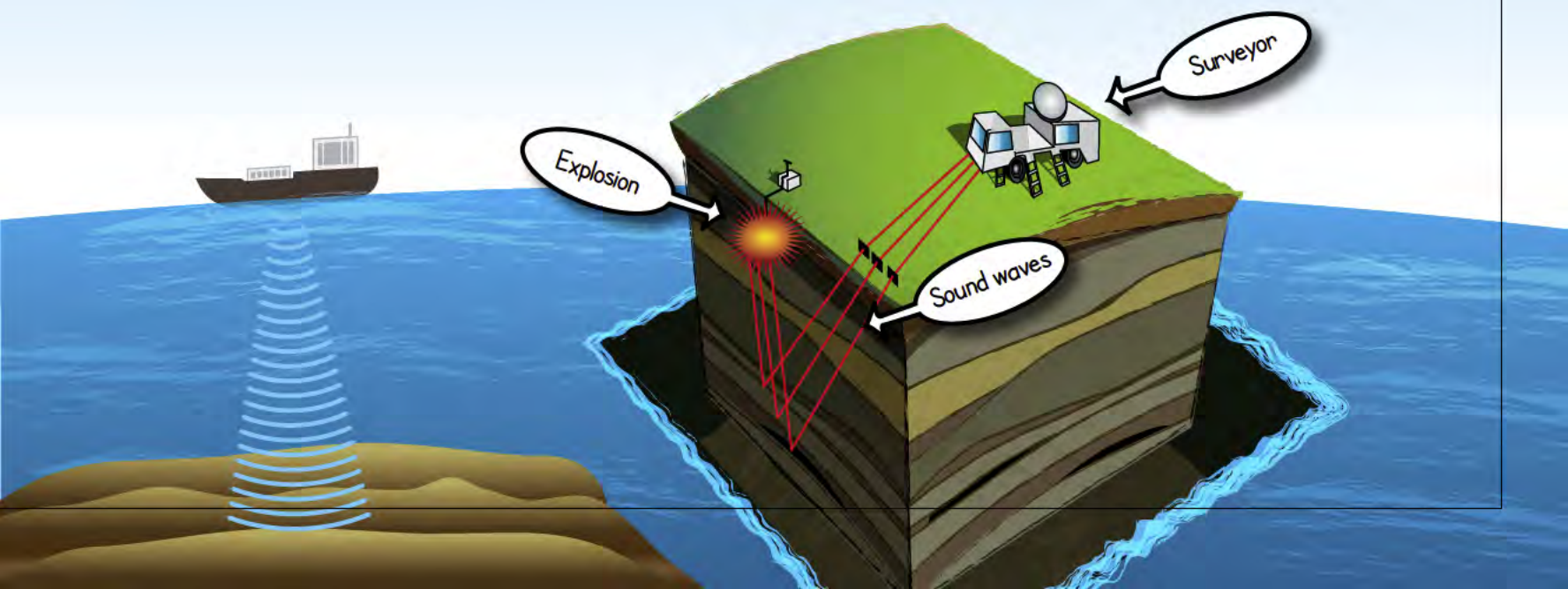


Oil can also be found underground at the bottom of the sea. In this case, special ships are used to look for these underwater oil fields. Geoscientists use several special technical tools—such as sound waves used in **seismic technology**—to form a clear picture of underwater rock layers.

But the only way to be absolutely sure that there is oil in the ground is simply to drill a well. This is a big gamble because not all wells result in the discovery of oil. It may take the drilling of many different wells until a new oil field is found. This costs a large amount of money because sophisticated equipment is needed and many people need to be hired.

That is why the geoscientists then supply all their survey data to the economists and financial planners at the oil companies, who help make the decision whether or not to drill exploratory wells.

Surveyors record the seismic waves that are produced by an explosion or sound generator. Since different rock types reflect sound waves differently, the surveyor can create a picture of the subterranean rocks.



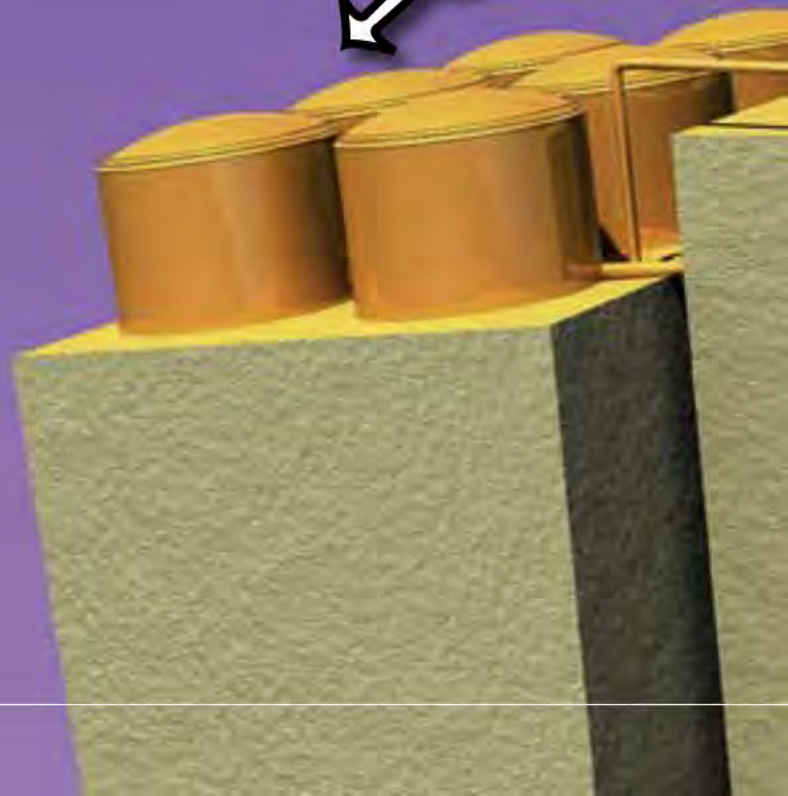
Production

Once oil is found after the preliminary exploration phase and the drilling of exploratory wells, the production phase can begin. There are two forms of drilling: onshore and offshore.

Crude oil found underground is usually mixed with water, sand, salt and natural gas. As it is extracted, the pressure of these different substances must be kept at just the right levels. This is done by turning valves on and off at the surface level. Because these valves are often green in colour and the small dials are red, much like the pine trees decorated at Christmas time, this assembly is often referred to as a *Christmas tree*.



Storage tanks



ONSHORE DRILLING

Onshore drilling is used for underground oil reservoirs anywhere on dry land. Drilling on land generally requires relatively low investments and entails fewer risks.

Once the crude oil is extracted from the ground, it is taken to gathering centres where the water, sand and salt are removed. While there, natural gas is also separated from the crude oil and then sent to a **booster station**.

The oil is then pumped to storage tanks before being sent to either a refinery for proper processing or to oil tankers for shipment elsewhere.

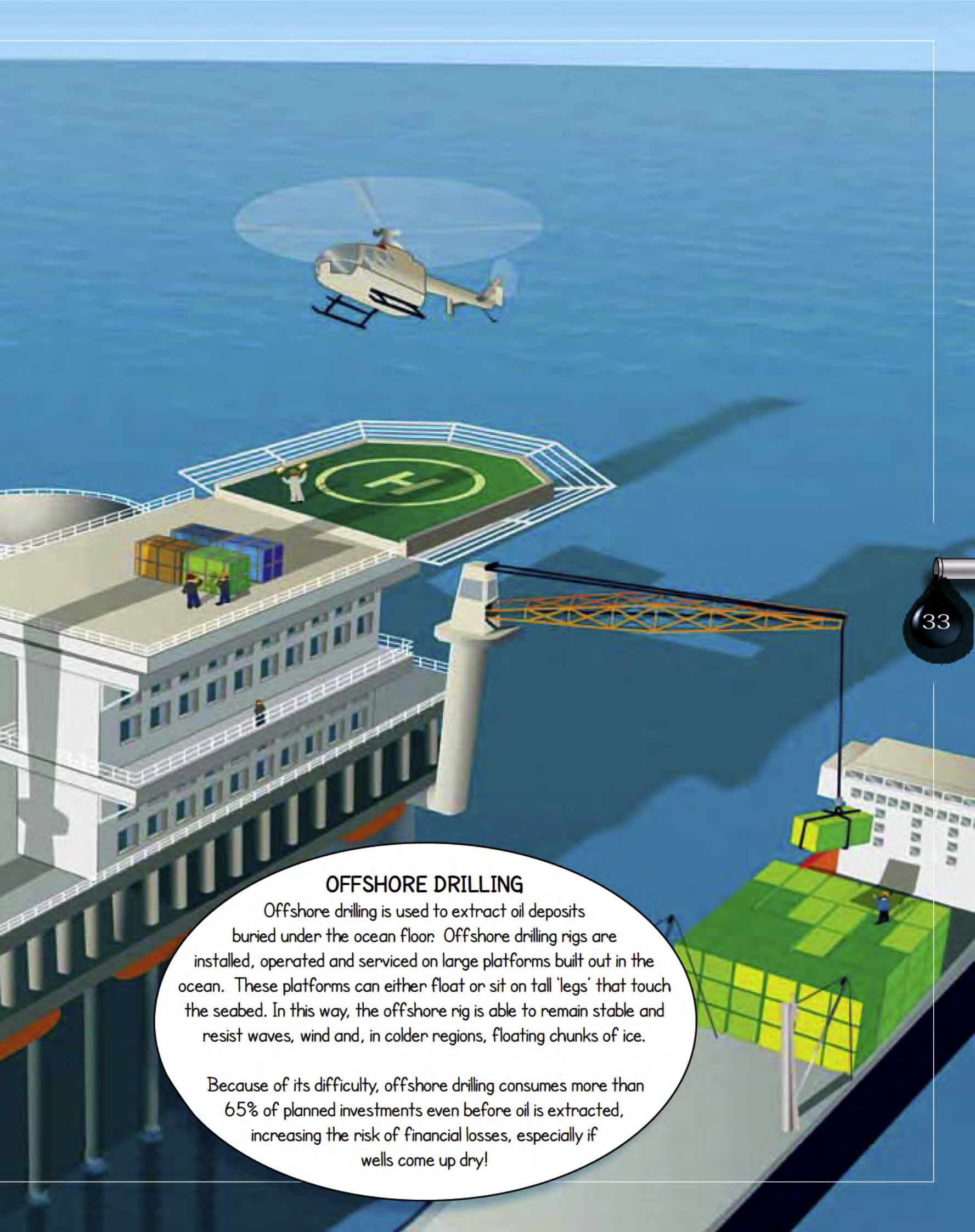
Pumping

Drilling

Tricone bit

Chapter 2 · Finding Oil (Upstream)





OFFSHORE DRILLING

Offshore drilling is used to extract oil deposits buried under the ocean floor. Offshore drilling rigs are installed, operated and serviced on large platforms built out in the ocean. These platforms can either float or sit on tall 'legs' that touch the seabed. In this way, the offshore rig is able to remain stable and resist waves, wind and, in colder regions, floating chunks of ice.

Because of its difficulty, offshore drilling consumes more than 65% of planned investments even before oil is extracted, increasing the risk of financial losses, especially if wells come up dry!

Huge investments are required

Finding underground oil reservoirs and drilling wells are risky, complicated and expensive activities. The cost of drilling an exploratory oil well can be anything from \$1 million to \$35 million.

Building and developing a well depends on many factors: the location of the potential oil field (if it is on land or under water), the size of the oil field, the amount of information that is already available and the type of rocks found underground.

That is why an important first step before drilling a well is to obtain information about what is going on thousands of metres below the surface of the Earth. This requires careful exploration and mapping of the 'sub-surfaces' in order to locate the exact type of rocks that tend to have oil deposits. All this requires investments in the latest geographic and seismic technology.



Many oil fields are found in hard-to-reach areas on land or below deep ocean water. New technology is helping oil companies reach these oil fields and increase the amount of oil extracted from the ground. But in order to pay for new technology, hundreds of millions of dollars in investments are needed.

The average amount of time needed to discover, extract and market oil is between 3 to 10 years. But oil explorers also need time to raise the necessary money in order to deal with all the technical challenges.

Much of the time needed depends on the location of the oil field. An offshore oil field in deep water can take much longer to discover and test, especially when the sea bottom is thousands of metres below the surface.



Refining Oil

DOWNSTREAM

THE ADVENTURE CONTINUES!

The story doesn't end once crude oil is found and produced from a well. More hard work is needed in order to get the crude oil to the marketplace and to turn it into products that can be used easily by consumers.


SO WHAT HAPPENS AFTER WE FIND OIL?

Once oil starts flowing, it needs to be extracted in large volumes and then taken to special sites where it is treated carefully before being transported internationally.

DOWNSTREAM

The **downstream sector** is the part of the oil industry involved with purifying crude oil and refining it into different products. It also involves the transportation and marketing of crude oil and its products.





The process through which crude oil is purified and treated to remove unusable substances is called **REFINING**. This process is also used to separate oil into different usable petroleum products. All this takes place in an oil refinery.

All refineries perform three basic functions:
SEPARATION
CONVERSION
TREATMENT.

Refineries are highly automated and technologically advanced. That is why a typical refinery costs billions of dollars to build. It also costs millions to operate, employing hundreds of people and running every day of the year.

SEPARATION

In this phase, a refinery heats crude oil to different temperature levels. Different parts of crude oil have different boiling points. As the temperature rises, these different parts or fractions are separated. This is done inside distillation towers.

The lightest fractions, which include gasoline and Liquefied Petroleum Gas (LPG), vaporize quickly and rise to the top of the distillation towers. There they condense back into liquids.

The medium-weight fractions, which include kerosene and diesel oil distillates condense in the middle of the distillation tower.

The heaviest liquids (called residual oils) have the highest boiling points and leave through the bottom of the distillation tower.

Refineries also use chemical agents called **CATALYSTS**. These help refine oil further by either removing carbon or adding hydrogen.



Refining methods are constantly being improved. A variety of complex operations are now used which have improved their output. Refineries today turn more than half of every barrel of crude oil into gasoline. One barrel is equal to 159 litres (42 US gallons). This is a big advance from only 70 years ago when only 41 litres (11 gallons) of gasoline were produced from each barrel of crude.



Chapter 3 · Refining Oil (Downstream)

CONVERSION

In this phase, high temperatures and pressure, as well as chemical catalysts, are used to 'crack' or split heavy hydrocarbon molecules into smaller, more desirable ones. This is the most widely used conversion method and it is called **CRACKING**.

This is carried out in a cracking unit which consists of a reactor with a thick wall, and a network of large furnaces, dividers and compartments.

Separation

Fluid
Catalytic
Cracker

Cracking

Coker

Other refining processes can rearrange hydrocarbon molecules rather than simply splitting them, while other processes clean them of impurities like sulphur (a process called desulphurization) which are harmful to the environment.

Refineries also treat the wastes produced by the refining process. This helps to minimize air and water pollution. Modern refineries are equipped with advanced pollution control systems. They purify waste water; remove chemicals and capture the emissions of gases and toxic materials.

An oil refinery is a network of interconnected buildings and plants where oil is pre-treated and divided into different parts or fractions. These fractions are then converted, treated further and blended to produce specific oil products according to pre-set specifications.

Naphta
Hydrotreater

Kerosene
Hydrotreater

Gasoline
Hydrotreater

Diesel
Hydrotreater

**Gasoline
Blending**

TREATMENT

The final phase is treatment. In this step, the fractions produced during separation are treated to improve their quality. They are then blended with other elements to produce the final products.

A variety of products can be made from crude oil, including gasoline, jet fuel, kerosene, diesel and petroleum **COKE**.

The different products are later placed in large storage tanks until they can be delivered to places such as gas stations, airports and chemical plants.

In addition to fuel oils, refineries can produce other oil-based products like asphalt, cleaning products, paints – and even some of the components used to make chewing gum and diapers!

Transportation

The transportation and delivery of crude oil is a big global business and an important part of the downstream sector. It includes the transfer of crude oil to the consuming countries and the distribution and sale of the products made from crude oil.

Getting oil from a well to a refinery, and getting the products to service stations, requires a complex system of transportation and storage. In fact, millions of barrels of oil are transported around the world every day through these pipeline networks, on fleets of tankers and on thousands of railway tanks and trucks.



PIPELINES

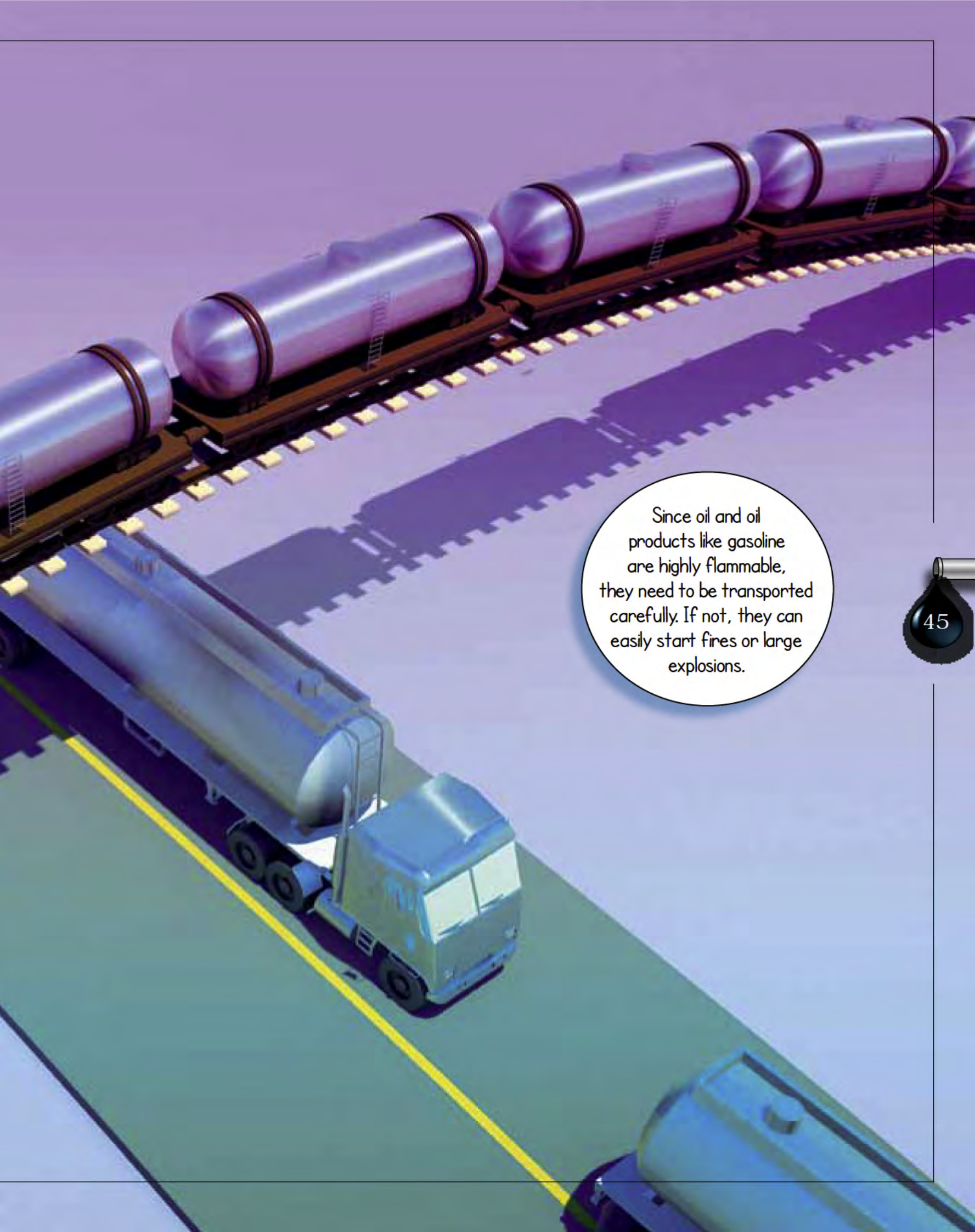
Oil pipelines are made from steel. They usually have an inner diameter of about 10 to 120 cm (about 4 to 48 inches) and can run for hundreds or thousands of kilometres. Advances in technology are constantly improving the size and strength of these pipelines.

Although pipelines are less flexible than other forms of transportation, they are the safest, most efficient and most economical way to move oil.

All large modern oil fields have direct connections to major pipelines. Without these pipelines, it would be impossible for oil and oil products to reach consumers.

ROADS AND RAILWAY

Oil products are also transported from storage centres to distribution areas on specialized railway tankers and trucks. These are large, long and have special storage units to protect against accidents.



Since oil and oil products like gasoline are highly flammable, they need to be transported carefully. If not, they can easily start fires or large explosions.

OCEAN TANKERS

Oil tankers are large, specialized ocean-going ships specifically built to carry unrefined crude oil from one part of the world to another. They usually carry oil from where it is produced to where it is refined and consumed.





Oil tankers are classified by their size, which can range from small coastal tankers to ultra-large crude carriers (ULCC). The largest tankers often travel from the Gulf region and West Africa to Japan and other Asian countries. Other tankers travel to the northeastern United States and to countries across the Mediterranean region.

OPEC'S MISSION

OPEC's mission is to coordinate oil policies in its Member Countries and help stabilize oil markets. It also includes working together—to make sure there is always a regular supply of oil available to consumers, and to make sure a steady income is generated for producers. All this is formally stated in the OPEC Statute.

Chapter 4

About OPEC

Finally, let's discuss the Organization known as OPEC

The Organization of the Petroleum Exporting Countries (OPEC) is an **intergovernmental organization** currently made up of twelve oil exporting countries that work together to coordinate their petroleum policies.

The Organization was formed in response to the activities and practices of seven large international oil companies (IOCs) known as the “Seven Sisters”. The activities of these IOCs were often detrimental to the growth and development of the oil-producing host countries, whose natural resources they exploited.

The first move towards the establishment of OPEC can be traced back to 1949, when Venezuela approached four other oil-producing developing countries—Iran, Iraq, Kuwait and Saudi Arabia—to suggest that they explore avenues for regular and closer cooperation on oil matters.

But the main impetus for OPEC's birth came a decade later, after the IOCs had decided to reduce the price of oil without first asking the governments. In response, several oil-producing countries decided to hold a meeting in Cairo, Egypt, in 1959. This was the First Arab Petroleum Congress. Iran and Venezuela were invited as observers.

The meeting adopted a resolution asking IOCs to consult the governments of oil-producing countries before changing the posted price of oil. But the IOCs ignored the oil-producing countries. And in August 1960, they once again lowered the price of oil.



1949

1959

FIRST ARAB LEAGUE PETROLEUM CONGRESS CAIRO

WELCOME!



Iran



Iraq



Kuwait



Saudi Arabia



Venezuela

Baghdad
1960



The birth of OPEC

In response to this, five of the largest oil-producing countries held another conference on September 10–14, 1960. This time the venue chosen was Baghdad, the capital of Iraq. The countries that attended the conference were: Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. These are the Organization's Founder Members. That was when OPEC was born.

Each country sent a delegate: Fuad Rouhani from Iran, Dr. Tal'at al-Shaibani from Iraq, Ahmed Sayed Omar from Kuwait, Abdullah Al-Tariki from Saudi Arabia and Dr. Juan Pablo Pérez Alfonzo from Venezuela.

At this Baghdad Conference, the delegates discussed the role of the IOCs and changes in crude oil prices. The oil-producing countries saw an urgent need to create an organization for the defence of their most important non-renewable natural resource, oil.

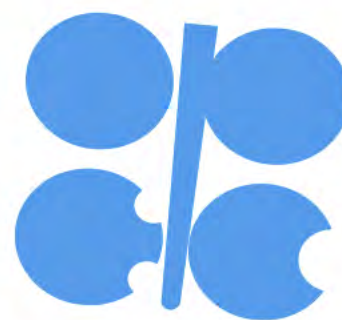
Thus, OPEC was established as a permanent intergovernmental organization. Its first headquarters were located in Geneva, Switzerland.

In April 1965, OPEC decided to move the Secretariat to Vienna, the capital of Austria. A Host Agreement was signed with the Austrian government and OPEC moved to Vienna on September 1, 1965.

After OPEC was created, the governments of OPEC's Member Countries began to have more control over their own natural resources. And in the years that followed, OPEC became increasingly aware of the important role it could play in the global oil markets.

THE OPEC LOGO

The OPEC logo is the recognizable symbol of the Organization. It is the result of an international design competition held in 1969. An Austrian designer, Gertrude Svoboda, won the competition with her design, which combined the different letters of the Organization's name in a rounded design. This logo is still in use by OPEC.



HE Fuad Rouhani
Head of Delegation, Iran



HE Dr. Tala'at al-Shaibani
Head of Delegation, Iraq

HE Ahmed Sayed Omar
Assistant to the Secretary of State
Ministry of Finance
Head of Delegation, Kuwait



HE Abdullah Al-Tariki.
Minister of Petroleum
Head of Delegation, Saudi Arabia

HE Dr Juan Pablo Pérez Alfonzo
Minister of Mines and Hydrocarbons
Head of Delegation, Venezuela



Chapter 4 · About OPEC



June 24th, 1965., Vienna, Austria, Headquarters Agreement between the Government of Austria and OPEC, Dr. Bruno Kreisky, Austrian Foreign Minister; and Dr. Ashraf Lutfi, OPEC Secretary General.



OPEC Headquarters, Geneva, 1960.



OPEC Headquarters, 1965.
Dr.-Karl-Lueger-Ring 10, 1010 Vienna, Austria



OPEC Headquarters, 1977.
Obere Donaustrasse 93, 1020 Vienna, Austria



OPEC Headquarters 2009.
Helferstorferstrasse 17, 1010, Vienna, Austria.

Who are the members of OPEC?

OPEC is made up of twelve **sovereign nations**: six in the Middle East, four in Africa and two in South America.

There are three categories of membership: Founder Members, Full Members and Associate Members.

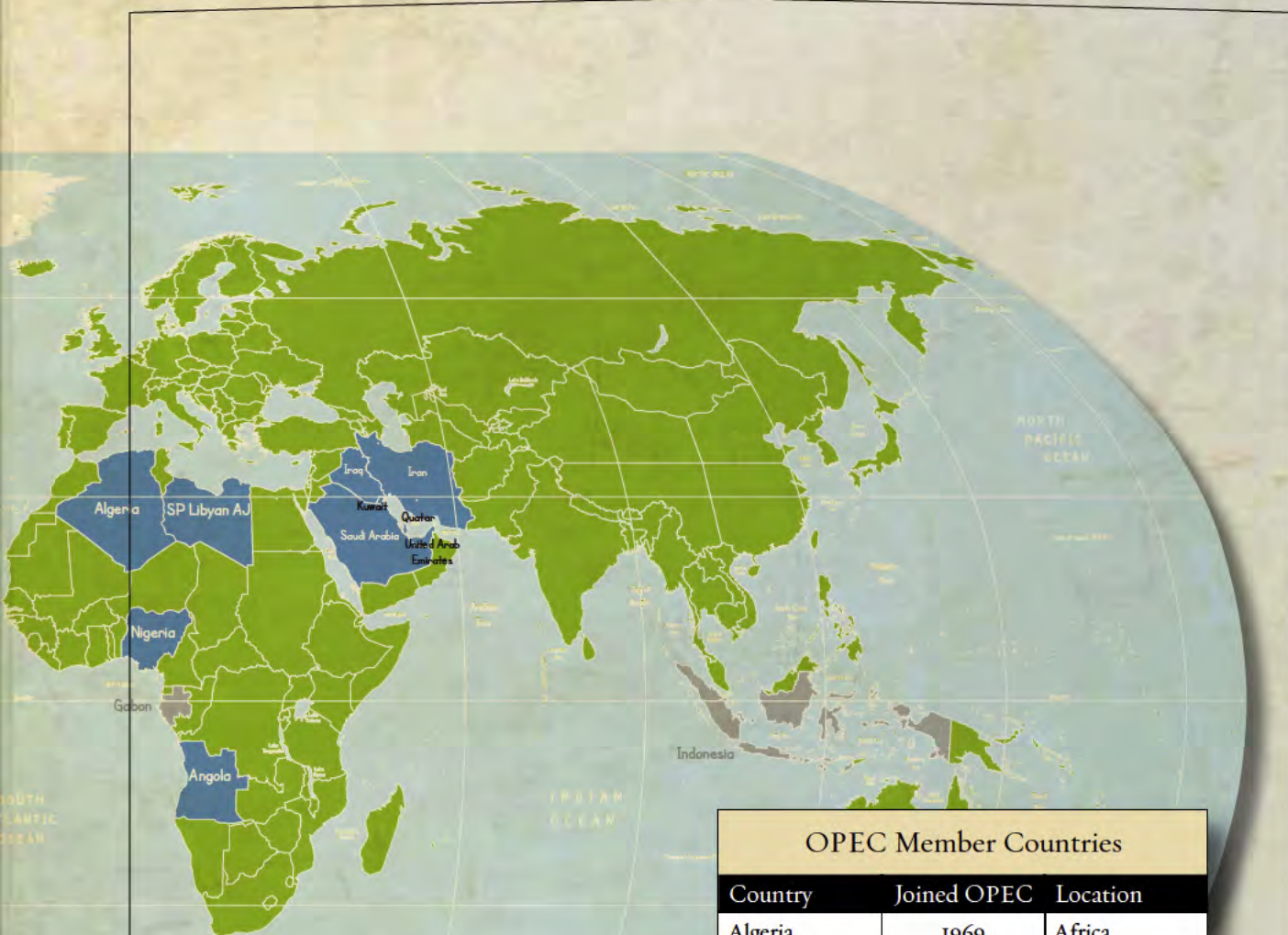
Founder Members of the Organization are those countries which attended the Baghdad Conference in 1960, and which signed the original agreement establishing OPEC.

Full Members are all Founder Members, plus those countries whose applications for membership have been accepted by the Ministerial Conference.

Associate Members are countries which do not qualify for full membership (see p. 58 regarding Who can be a member?), but which are nevertheless admitted under special conditions.

The oil producing capacity of each Member Country is different. But when it comes to making decisions as an Organization, every country is equal. Decisions must be made unanimously with the agreement of all Member Countries.





OPEC Member Countries

Country	Joined OPEC	Location
Algeria	1969	Africa
Angola	2007	Africa
Ecuador **	1973; 2007	South America
Gabon ***	1975	Africa
Indonesia ****	1962	Asia
IR Iran*	1960	Middle East
Iraq *	1960	Middle East
Kuwait *	1960	Middle East
SP Libyan AJ	1962	Africa
Nigeria	1971	Africa
Qatar	1961	Middle East
Saudi Arabia *	1960	Middle East
United Arab Emirates	1967	Middle East
Venezuela *	1960	South America

* Founder Members

** Ecuador joined OPEC in 1973 and suspended its membership from December 1992 to October 2007.

*** Gabon terminated its membership in 1995.

**** Indonesia joined OPEC in 1962 but suspended its membership effective January 2009.





Representatives of the five Founder Members at a Board of Governors meeting in the 1960s

Who can be a Member?

OPEC membership is open to any country that exports crude oil and which shares the ideals of the Organization.

A country may become a Full Member if its request to join OPEC is accepted by a three-fourths majority of Full Members (including all Founder Members).

If most of the oil a country produces is consumed internally—to meet domestic demand—then it may not be able to join OPEC. Nevertheless, that country

may still be admitted as an Associate Member.

An Associate Member may be invited to attend any of the Organization's meetings. While an Associate Member may participate in these meetings, it does not have the right to vote.

In addition, other oil-producing countries that are not members of OPEC may also be invited to attend Meetings as Observers.

Keeping the market supplied

Throughout its 50-year history, OPEC has seen periods of both extremely high and low oil prices. Each time OPEC has tried to respond in an appropriate manner.

OPEC does this by coordinating the oil policies of its Member Countries.

If demand suddenly grows and supplies fall short, OPEC can increase its oil production in order to keep the market well supplied. On the other hand, if demand suddenly falls and supplies grow, OPEC can slow down production in order to help maintain a balance in the market.

OPEC's actions at critical times have demonstrated the Organization's ability to keep the oil market well-supplied during different kinds of unexpected events, such as wars or natural disasters.

Stabilizing oil markets

One of the most important parts of OPEC's mission is making sure that the oil markets remain stable. One way that OPEC tries to do this is by working to avoid price extremes (when oil prices are too low or too high).

Avoiding price extremes—and sudden changes in prices—is important for producers and consumers. When oil prices are too high or too low, problems can be generated for the global economy.

For example, with extremely high oil prices, it costs more to do things—like run a car, operate a machine or make products like plastics.

But extremely low oil prices also cause problems. If the price of crude oil is too low, then it doesn't make sense to spend money trying to find more oil. Investments in projects may then fall.



157th Meeting of the OPEC Conference in session in Vienna, Austria, October 2010.

Organizational Structure

THE CONFERENCE

The Conference is OPEC's supreme authority. It consists of Heads of Delegations from each Member Country. It is responsible for the formulation of the Organization's general policies.

The Conference meets twice a year to look at market conditions. These are 'Ordinary Meetings'.

In addition, the Conference holds 'Extraordinary' Meetings when required.

BOARD OF GOVERNORS

OPEC's Board of Governors is composed of representatives nominated by Member Countries and confirmed by the Conference.

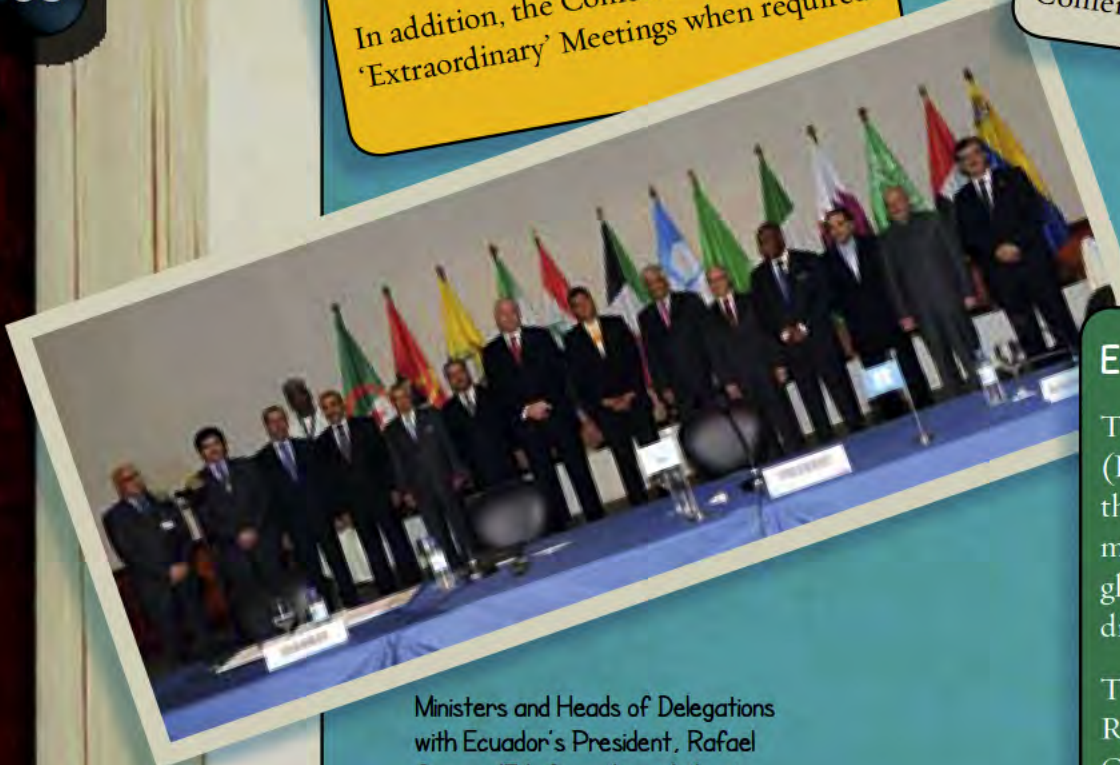
The Board manages the Secretariat, implements the resolutions of the Conference, prepares the Secretariat's annual budget and submits it to the Conference for approval.

The Board makes decisions based on reports submitted by the Secretary General. The Board also submits its own reports and recommendations on the activities of the Organization to the Conference.

ECONOMIC COMMISSION BOARD

The Economic Commission Board (ECB) is a special research body within the Secretariat. It considers current market conditions, the situation of the global economy and forecasts the future direction of market fundamentals.

The ECB is composed of National Representatives from Member Countries, a Commission Coordinator (who is also the Director of the Secretariat's Research Division) and the Secretary General.



Ministers and Heads of Delegations with Ecuador's President, Rafael Correa (7th from the right), at the 158th Meeting of the OPEC Conference in Quito, Ecuador, December 2010.

THE SECRETARIAT

The OPEC Secretariat is responsible for carrying out the executive functions of the Organization, according to the OPEC Statute and under the direction of the Board of Governors.

The Secretary General is the Chief Executive of the Secretariat, as well as the legally authorised representative of the Organization. He is assisted directly by the Office of the Secretary General, a Legal Office and an Internal Auditor. OPEC's first Secretary General was HE Dr. Fuad Rouhani of Iran.

The Secretariat consists of a Research Division, which monitors, forecasts and analyzes developments in the global energy industry. The Research Division consists of the Departments of Data Services, Energy Studies and Petroleum Studies.

The Secretariat is also made up of a Support Services Division, which includes the Departments of Administration and Information Technology, Finance and Human Resources, and Public Relations and Information.

The Secretariat is a multicultural working environment. It has employees drawn from more than 30 different countries. About a quarter of them are from Member Countries. Others are international employees.

The official language of the Organization is English.

INFORMATION CENTER

The Secretariat has an Information Centre with over 20,000 volumes—including books, reports, maps and conference proceedings—related to petroleum, energy and the oil market. It keeps journals in Arabic, English, French, German and Spanish. The Information Centre is open to the public and is often used by researchers and students.



THE OPEC SUMMIT

Though not a formal organ of the Organization, the OPEC Summit brings together Heads of State of OPEC Member Countries to discuss issues of global importance and make policy recommendations to guide the Organization.

The OPEC Summit has proved to be a very effective way to make group decisions and provide opportunities for leaders to review the role of the Organization in world affairs.



Building bridges

Global events in recent years have demonstrated the interconnected nature of today's world. It is thus more important than ever to coordinate actions and work together with others when tackling these global challenges. This is especially true for the oil industry, which reaches all corners of the Earth.

There are several issues that OPEC considers priorities for all global energy **stakeholders**. One of these is improving communications—through dialogue and cooperation—between oil producers and consumers.

This is especially important in order to avoid market instability. OPEC has always said that avoiding instability and preserving market stability can only be achieved by cooperating with other **non-OPEC oil producers**.

OPEC regularly meets with these other major oil producers such as Russia to improve the understanding of the oil industry and seek appropriate policy actions.

Since it is an organization of oil-producing countries, OPEC also meets regularly with large oil consumers. In fact, OPEC has an on-going dialogue with the European Union. OPEC also holds meetings and workshops with China.

In addition, OPEC holds dialogues with other international organizations—such as the International Energy Agency (IEA)—and participates in

ongoing dialogue with other energy stakeholders under the framework of the International Energy Forum (IEF).

Another issue that OPEC considers important for all global energy stakeholders is the role that governments and people everywhere have in environmental protection efforts.

OPEC Member Countries are continually looking for ways to work with others on this. The Organization has participated in environmental conferences and seminars, and has undertaken extensive studies of the relationship between the energy sector and global warming.

At the same time, OPEC also supports the efforts of its individual Member Countries to do what they can at the national level—such as develop new technologies that enhance the environmental credentials of oil and reduce the environmental impact of activities in the energy sector.

To emphasize their overall commitment to the environment, the leaders of OPEC Member Countries agreed to several principles set forth in the 'Riyadh Declaration' issued at the conclusion of the Third OPEC Summit of Heads of State held in Saudi Arabia in 2007. In it, the Heads of State of OPEC Member Countries agreed that the themes of stability, sustainable development and the environment should guide all Member Country initiatives.

How does OPEC help other countries?

For decades, OPEC and its Member Countries have found different ways to help poor countries. Much of this has been through individual Member Country national funds which have made donations and aid available to poor countries, through bilateral and multilateral arrangements.

Another way that OPEC helps is through the OPEC Fund for International Development (OFID), which helps finance projects with low-interest loans.

During the First OPEC Summit in Algiers, Algeria, held in 1975, OPEC Member Countries asked the international community—especially developed countries—to work together to help respond to the challenges facing developing countries. Following this Summit, in January 1976, OPEC's Member Countries decided to establish the OPEC Special Fund. This later became known as the OPEC Fund for International development (OFID).



WHAT IS OFID?

The OPEC Fund for International Development (OFID) is an institution that provides funding and other support to developing countries around the world. According to the agreement establishing OFID, all developing countries (with the exception of OPEC Member Countries) are eligible for OFID assistance.

OFID is active in many regions of the world. So far, people in 122 countries in Africa, Asia, Latin America, the Caribbean, the Middle East and Europe have benefited from OFID's programmes. These programmes have included clean water and energy projects; building schools, hospitals and roads; and developing industry and expanding trade opportunities.

These programmes have been financed by low-interest loans that OFID provides to the public sector in recipient countries. OFID also provides financing for private sector projects in developing countries, and provides grants to social and humanitarian projects.

OFID's financial resources come from its investments, loans and the voluntary contributions made by OPEC Member Countries. By the end of September 2010, OFID's total approved commitments stood at US\$ 12,568 million (of which US\$7,644 million has been disbursed).

For more information, visit www.ofid.org or write to: OFID, Parkring 8, A-1010 Vienna, Austria.

Glossary of Terms

API gravity — Developed by the American Petroleum Institute (API), the API gravity scale measures how heavy or light petroleum liquids are—its relative density—when compared to water. Although mathematically, API gravity has no units, it is nevertheless referred to as being measured in “degrees”. When the API gravity is greater than 31, the petroleum is considered lighter than water; when it is less than 31, it is heavier than water.

Benchmark — In general, a benchmark can be anything that serves as a point of reference or standard against which other things can be compared, measured or evaluated. In the oil industry, benchmarks are used to establish the appropriate price of crude oil and are needed due to the existence of so many different varieties and grades of crude. By referring to a specific crude oil as a benchmark, traders can determine the price and value of other kinds of crude. The most widely accepted benchmarks in the industry are Brent, Dubai, West Texas Intermediate (WTI) and the OPEC Reference Basket (ORB) of Member Country crudes. Brent is used to price most of the world's crudes; Dubai is used to price regional crudes from the Gulf; WTI is usually used to price oil in the US.

Bitumen — Bitumen is a black, viscous sticky organic liquid composed primarily of condensed chemical compounds. Often referred to as ‘asphalt’ or ‘asphalt cement’, bitumen is usually a by-product or residue that is left after the fractional distillation of crude oil and is the one with the highest boiling point. Most bitumen contain sulphur and heavy metals such as lead, chromium, mercury, nickel and vanadium, as well as other toxic elements.

Booster station — This is a specialized station where crude oil received from one main pipeline is pressurized so that it can then be sent to the next destination or terminal for further transportation or refining.

Catalyst — A catalyst is any chemical substance that accelerates the rate of a reaction without being used up itself in the process. In the oil refining processes, chemical catalysts speed up cracking. Catalysts include bauxite, zeolite and silica-alumina.

Christmas tree — In the oil and gas industry, a Christmas tree is an assembly of valves, dials and other fittings that help control the level of oil, gas and/or water at an oil or gas well. It has the very rough appearance of a green Christmas tree with red decorations.

Coke / coking — Coke is the product of a refining process known as ‘coking’ that uses heat and pressure to decompose (or ‘coke’) heavy crude oil (or residual oil). It produces a mix of lighter oils that can then be blended or processed into other products. Petroleum ‘coke’ can even be used as a fuel or as an input in other industrial processes.

Cracking — This is a refinery process where heavier, more complex forms of hydrocarbons are broken down (or ‘cracked’) into lighter and simpler forms by breaking the bonds between carbon molecules. Through this process, higher value hydrocarbon products are produced. Cracking can be done by applying heat (thermal cracking), through the application of a chemical catalyst (catalytic cracking) or with catalysts and hydrogen (hydro-cracking).

Crude oil — Crude oil is a mixture of hydrocarbons that exist in liquid form in natural underground reservoirs and which remain liquid at atmospheric pressure after passing through surface separating facilities. Substances reported as crude oil include: liquids technically defined as crude oil; small amounts of hydrocarbons that exist in a gaseous form in natural underground reservoirs but which are liquid at atmospheric pressure after being recovered from gas.

Distillate yields — In the refining process, when crude oil is compressed and heated, it produces (or yields) different substances (distillates) at successively high temperature levels.

Fractions — This refers simply to the different products that can be separated or refined from crude oil.

Geoscientist — Geoscientists are experts who look at and study the physical aspects of the Earth in order to better understand the composition of its rocks, underground water

and earth. They are often employed in the search for oil, as well as other natural resources.

Grades — Grades refers to a way of classifying the many varieties of crude oil that exist around the world. The commonly accepted grades are:

- **Light / Heavy** — These terms refer to different grades of crude oil. Heavy crude has a low API Gravity and a high proportion of heavy hydrocarbon fractions; light crude has high API Gravity but a low proportion of light hydrocarbon fractions. Both heavy and light crudes can also be classified as sour or sweet.

- **Sour / Sweet** — These are terms used to denote a given crude oil's sulphur content. Crude oil with a high sulphur content (0.5% by weight and above) is considered sour; crude with a low sulphur content (less than 0.5%) is considered sweet. Either kind of crude can also be further classified as heavy or light.

Hydrocarbons — Any organic compound that is made up of only hydrogen and carbon atoms is considered a hydrocarbon. Crude oil is a kind of liquid hydrocarbon.

Intergovernmental organization — An inter-governmental organization is an organization set up by and composed of several governments from any region of the world who share a common interest. They work collectively and collaboratively to achieve their common objective and to carry out projects and plans that benefit the organization.

Non-OPEC oil producers — These are countries that produce and export oil but which are not members of OPEC.

Non-renewable energy — Energy sources which exist in nature in finite quantities are considered non-renewable sources of energy. These include coal, natural gas, nuclear energy and petroleum. Renewable energies, on the other hand, are those energies that are continuously available, such as wind and solar energies.

Permeability — This is the condition of allowing substances like water to flow into or out of an object. When a rock is porous and allows oil to accumulate in it or flow out of it easily, it is considered highly permeable.

Seismic — Anything that has to do with vibrations or tremors in an object or a body. This is most often used when describing vibrations in the Earth, which can be naturally occurring (as in earthquakes). In oil exploration, seismic technology sends sound waves that cause underground vibrations, bounce back to the measuring tools and are then measured and analyzed for signs of oil deposits.

Sovereign nations — A country or nation that has complete political authority over its own decisions and actions is considered sovereign.

Stakeholders — This refers to any number of individuals or groups that have an interest (or a 'stake') in some event or process. It is a term that is often used to refer simply to those who stand to benefit or lose from the pursuit of a particular policy or action.

Upstream / downstream — These are the two major sectors of the oil industry. The upstream generally refers to the exploration and production aspects of the business, and pertains to all the activities and equipment located in both the production train and above the surface by the wellhead. The downstream, in turn, denotes the commercialization of petroleum products, referring to operations after the production phase — that is, oil refining and retailing, and the distribution of refined products.

Sources: Barron's Dictionary of Finance & Investment Terms, CFTC Glossary, Energy Information Administration, IMF Terminology Database, Merriam-Webster Dictionary, NYMEX's Glossary of Terms, OPEC, Oxford English Dictionary, Schlumberger's Oilfield Glossary, The Street, The United Nations.

Bibliography & Resources

"Excerpts for Rock Talk." Vol. 7, No. 2. Geotech.
<http://www.geotech.org/survey/geotech/Oil.pdf>.

Energy Information Administration. *International Energy Outlook, 2010*. Washington, DC: US Department of Energy, 2010.

"Energy Kids." US Energy Information Administration.
<http://www.eia.doe.gov/kids/index.cfm>.

"Energy ... What Are We Talking About?" All About Energy.
<http://www.planete-energies.com/content/energies/definition.html>.

Ghanem, Shukri M. *OPEC: The Rise and Fall of an Exclusive Club*. London: Routledge, 1986.

Griffin, James A. and David J. Teece. *OPEC Behavior and World Oil Prices*. London: Unwin Hyman, 1982.

"Heavy Oil Science Centre." Lloydminster.
<http://www.lloydminsterheavyoil.com/whatislaunch.htm>.

"How Does an Oil Refinery Work?" Chevron in Canada.
<http://www.chevron.ca/operations/refining/separation.asp>.

"IEA Topic Page." International Energy Agency.
<http://www.iea.org/subjectqueries/index.asp>.

"Key Issues." World Petroleum Council.
<http://www.world-petroleum.org>.

Mabro, Robert. "OPEC and the Price of Oil." *The Energy Journal*, 1992.

Mommer, Bernard. *The New Governance of Venezuelan Oil*. Oxford: Oxford Institute for Energy Studies, 1998.

"Oil." Kids Net Encyclopedia.
<http://encyclopedia.kids.net.au>.

Oil and Natural Gas. London: DK Adult, 2007.

"Oil Refineries." Moorland School.
<http://www.moorlandschool.co.uk/earth/oilrefinery.htm>.

OPEC. *Annual Statistical Bulletin, 2009*. Vienna: The OPEC Secretariat, 2009.

OPEC *World Oil Outlook, 2009*. Vienna: The OPEC Secretariat, 2009.

OPEC. *World Oil Outlook, 2010*. Vienna: The OPEC Secretariat, 2010.

OPEC. *OPEC Bulletin*. September 2005.

OPEC. *OPEC Bulletin*. September 2010.

OPEC. <http://www.opec.org>.

Parra, Francisco. *Oil Politics: A Modern History of Petroleum*. London: I.B. Tauris, 2004.

Perez Alfonzo, Juan Pablo. *The Petroleum Pentagon*. Trans. of El Pentágono Petrolero (1967). Vienna, Austria: Organization of the Petroleum Exporting Countries, 2003.

Qabazard, Hasan M. *Petroleum*. Presentation at the Kuwait Institute for Scientific Research, Petroleum Research and Studies Centre and interview at the OPEC Secretariat, 2010.

Seymour, Ian. *OPEC: Instrument of Change*. London: Macmillan Press Ltd., 1980.

Smil, Vaclav. *Energy: A Beginner's Guide*. Oxford: One World, 2006.

Smil, Vaclav. *Energy at the Crossroads: Global Perspectives and Uncertainties*. Cambridge, Massachusetts: The MIT Press, 2005.

Terzian, Pierre. *OPEC, the Inside Story*. Trans. Michael Pallis. La increíble historia de la OPEP. London: Zed Books, 1985.

"What is Crude Oil?" Chevron.
<http://www.chevron.com/products/sitelets/pascagoula/refiningprocess/whatiscrude.aspx>.

"What is Crude Oil and What is It Used For?" College of Earth, Ocean and Environment at the University of Delaware.
<http://www.ocean.udel.edu/oilspill/crudeoil.html>.

Yeomans, Matthew. *Oil: Anatomy of an Industry*. New York: The New Press, 2004.

Yergin, Daniel. *The Prize*. New York: Simon & Schuster, 1991.

Contributors

Director, Research Division

Dr. Hasan M Qabazard

Head, Public Relations & Information Department

Ulunma Angela Agoawike

Public Relations Coordinator

Zoreli Figueroa

Editor

Mario Fantini

Design and Production Coordinator

Alaa Al-Saigh

Additional input by

Dr. Fuad Siala, Dr. Taher Najah, Dr. Pantelis

Christodoulides, Dr. Mohammad Taeb y

Elio Rodriguez

Additional support was provided by

Ghada Sahab, Diana Golpashin, Diana Khoury,

Andrea Birnbach, Sheila Kriz, Beatrix Mayer-Karolyi

and Yi Wen Huang



Organization of the
Petroleum Exporting Countries
Helferstorferstrasse 17,
A-1010, Austria
www.opec.org

ISBN 978-3-200-02193-8