



WELCOME TO THE PRESENTATION ON DOWNSTREAM PETROLEUM AND SOLID MINERALS AUDIT (MONITORING UP TO SELLING POINTS)

MK NAIR

SENIOR DEPUTY ACCOUNTANT GENERAL

SUPREME AUDIT INSTITUTION – INDIA

Scheme of Presentation

- ☐ Introduction to Extractive Industries (3-4)
- ☐ Crude Oil (5)
- ☐ Quick recap of E&P activities – E&P cycle, survey, data analysis and sequencing, Rigs, drilling, oil processing and evacuation (7-13)
- ☐ Refining process (14-26)
- ☐ Downstream Infra. (27)
- ☐ Modes of transport of petroleum products (28)
- ☐ Audit checks in downstream (29-30)
- ☐ Solid Minerals, Mining cycle (32-36)
- ☐ Legal Framework in India (37)
- ☐ Prospecting and Mining Lease (38)
- ☐ E Auction (39-40)
- ☐ Role of Audit and Audit Report of SAI –India (41-44)
- ☐ Illegal mining (45)
- ☐ Best practices (46)

EXTRACTIVE INDUSTRIES - INTRODUCTION

- Industries involved in the process or activities that lead to the extraction of raw materials from the earth (such as oil, metals, mineral coal etc.), processing and utilization by consumers.
- Onshore or offshore.
- Extracted materials are in the liquid, gas or solid state – Requires further processing.
- Could impact Environment, Economic and Social life.
- Impact on Environment is always considered negative.
- Social impact – Mixed, but mostly negative.
- Despite negative impact, sustainable development calls for extraction.

EXTRACTIVE INDUSTRIES - INTRODUCTION

- **Liquid and gas- focus on fossil fuel-petroleum.**
- **Solid minerals such as Iron ore, coal, copper, zinc, stones, sand etc.**
- **Fossil fuel**
 - Trapped fossil fuels over millions of years are extracted.
 - Only about one per cent is explored as trapping and extraction requires conducive geological sub surface like sedimentary basin, source rock, cap rock, permeability, porosity etc.
 - Two Petroleum cycles – Upstream and Downstream.
 - Upstream includes Exploration and Production (E&P) in offshore and onshore.
 - Downstream includes Refining and Marketing.

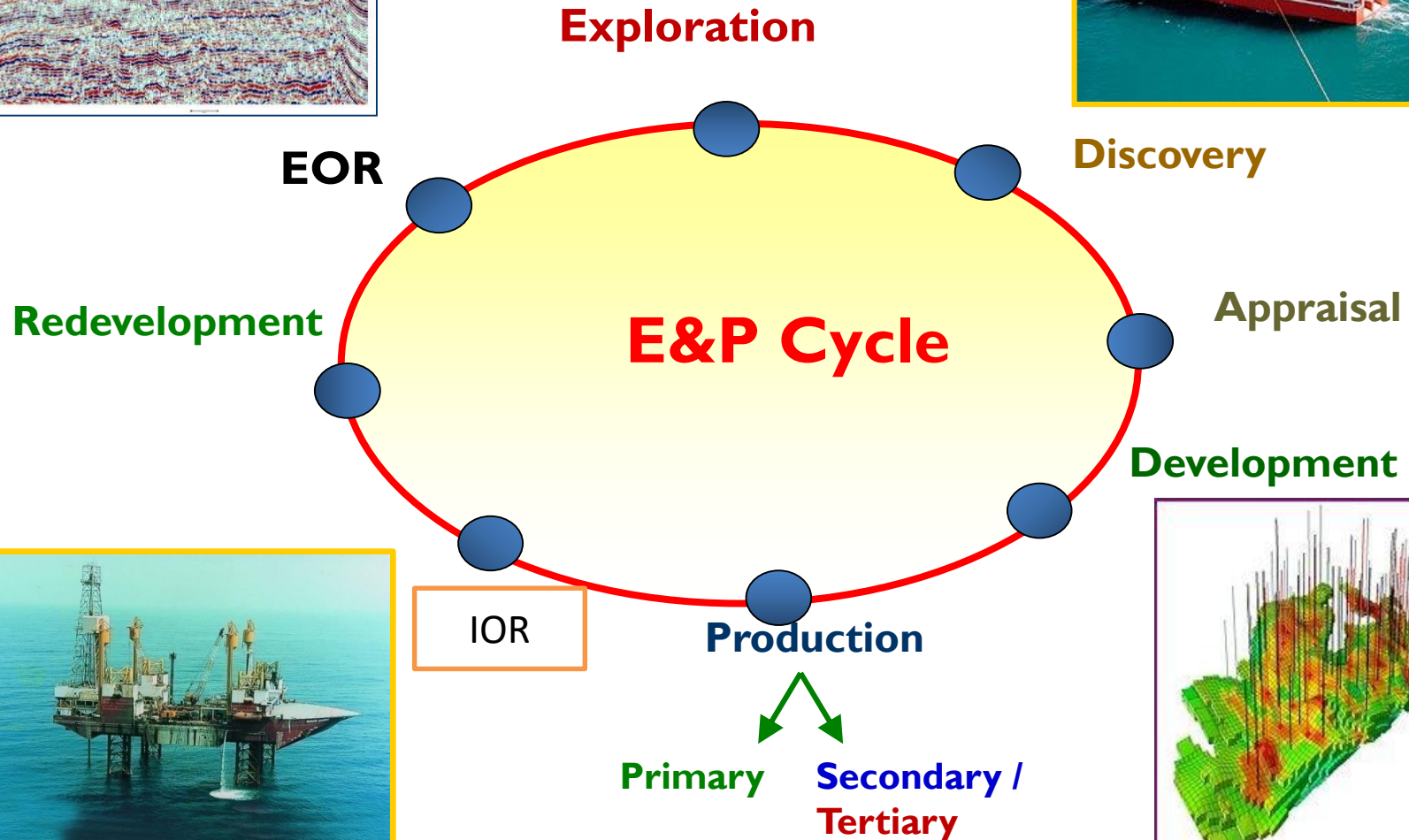
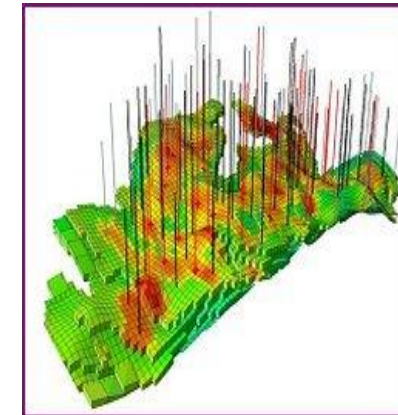
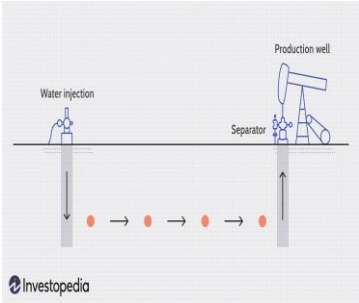
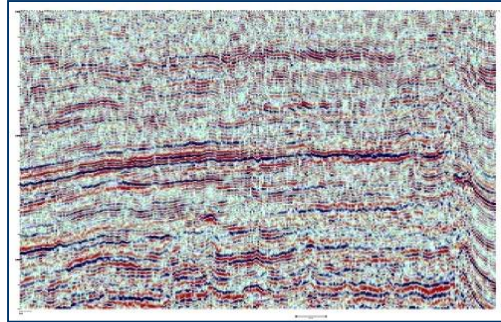
What is Crude oil

- A liquid mixture of thousands of organic chemicals found underground. It is the result of organic matter decaying over millions of years; hence the name Fossil Fuel.
- Volatile liquid hydrocarbons (compounds composed mainly of hydrogen and carbon), though it also contains some nitrogen, sulfur, and oxygen.
- Found all over the world and varies tremendously in density, aromatics, Sulphur and metal content.

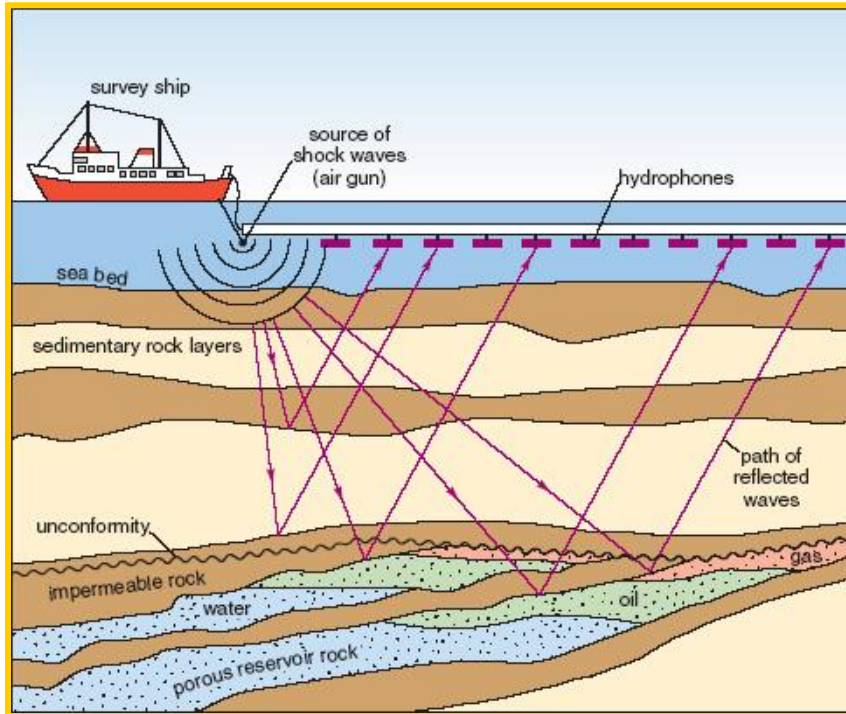
Quick recap of
how crude is
extracted



The Exploration and Production cycle



Seismic Data Acquisition and Interpretation



- **Seismic reflection is the principal method by which petroleum industry images hydrocarbon bearing structures**
- **Compressed air guns towed behind a seismic vessel discharge high pressure pulse of air just beneath the sea surface.**
- **High pressure pulse penetrate the subsurface and are reflected back towards the hydrophones / Geophones from the rock interface**

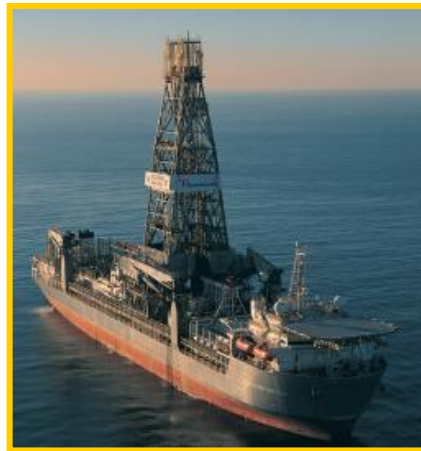
Sequencing of E&P functions

- Discrete data is converted into continuous data.
- Data interpreted in data center.
- Prospects are identified for focused attention.
- Exploratory wells are drilled.
- Geological modelling is done and analysed.
- Delineation wells are drilled to explore the extent of reservoir.
- Commercial viability is established before development.
- Development wells are drilled and platforms put in place.
- Production commences.

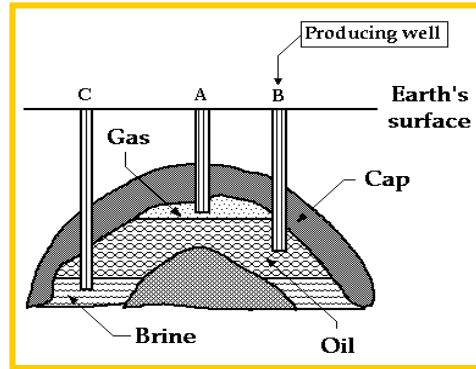
Drilling- Different Options



Onland Rig



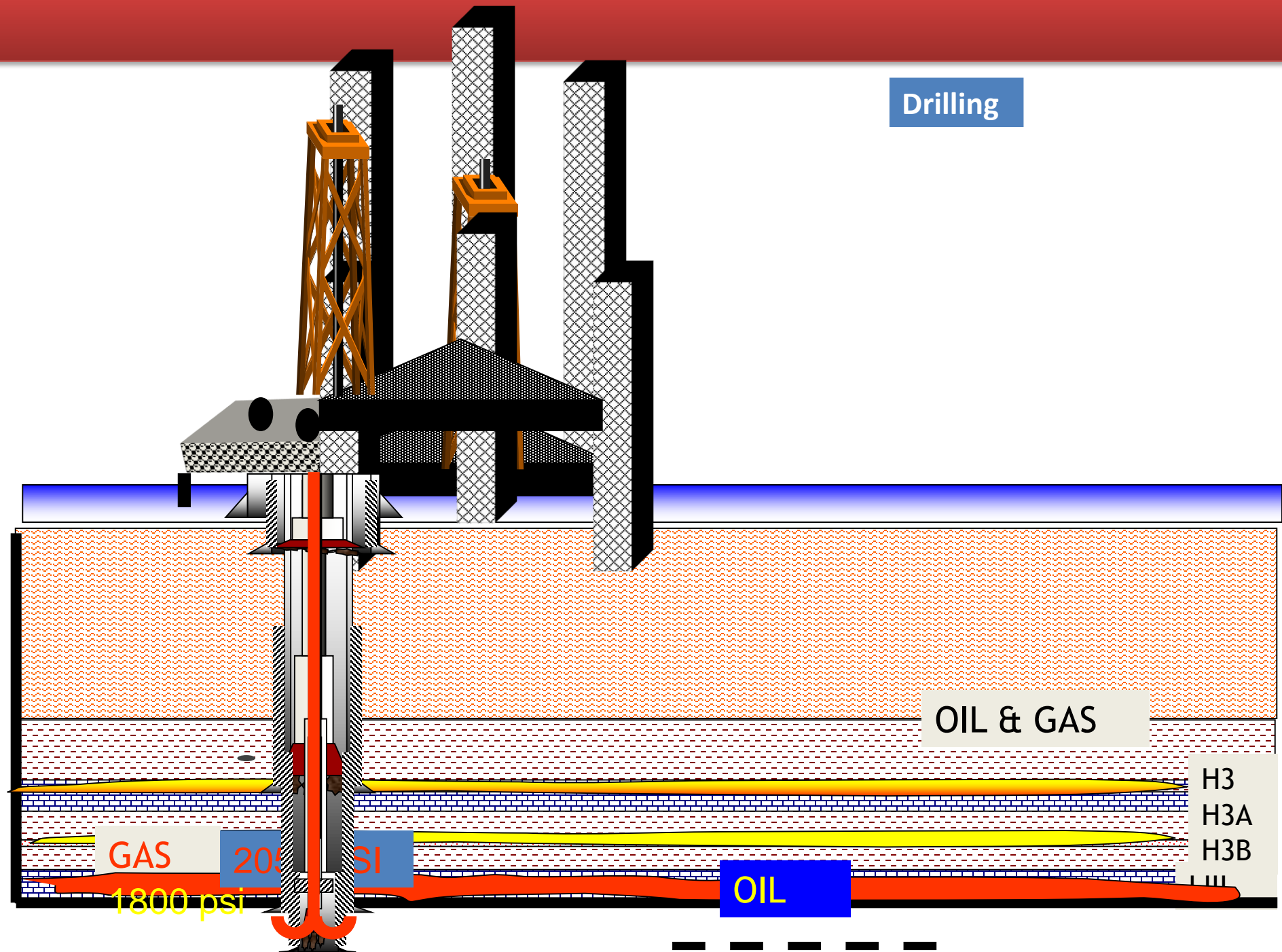
Drill Ship



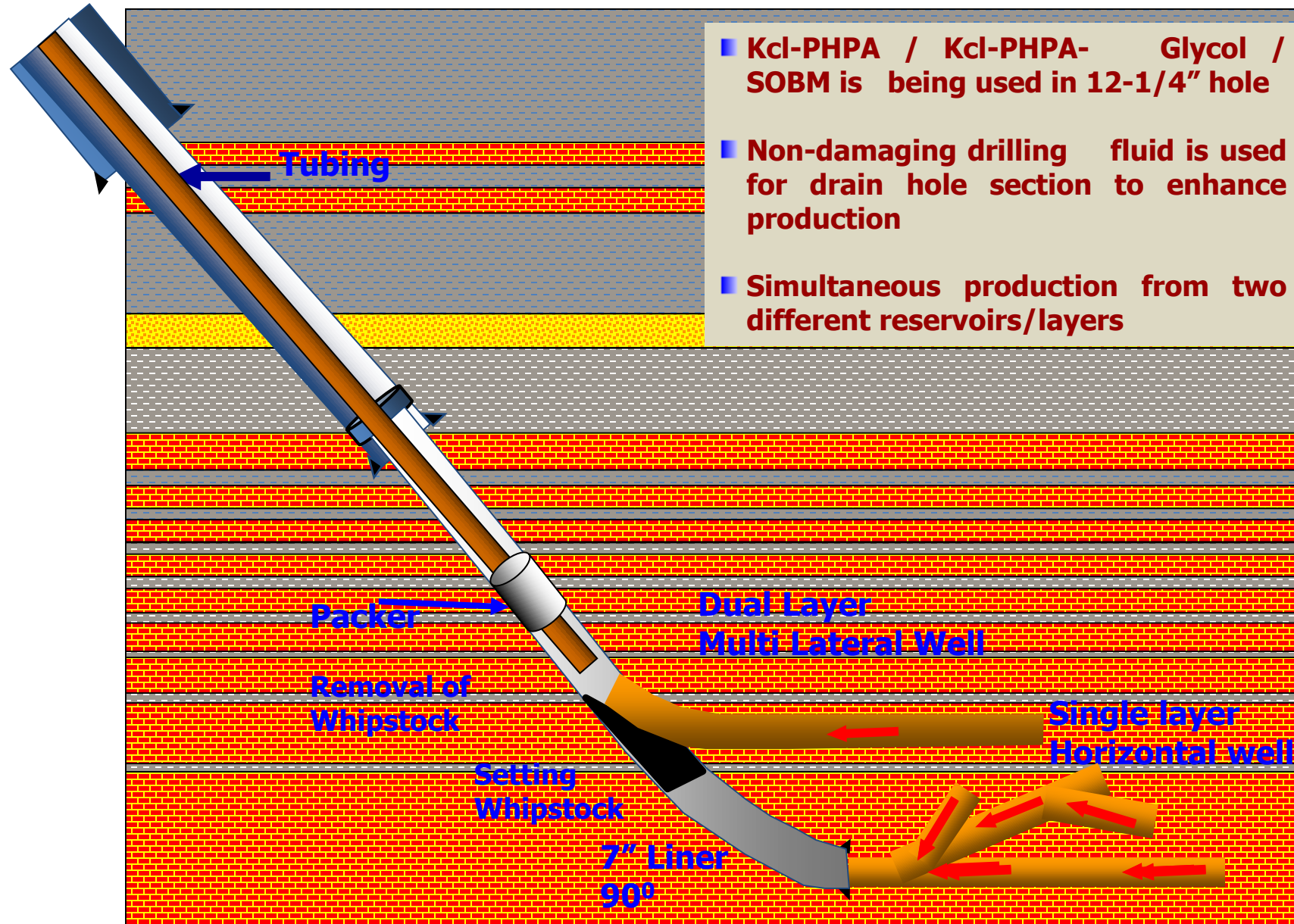
Jack Up Rig



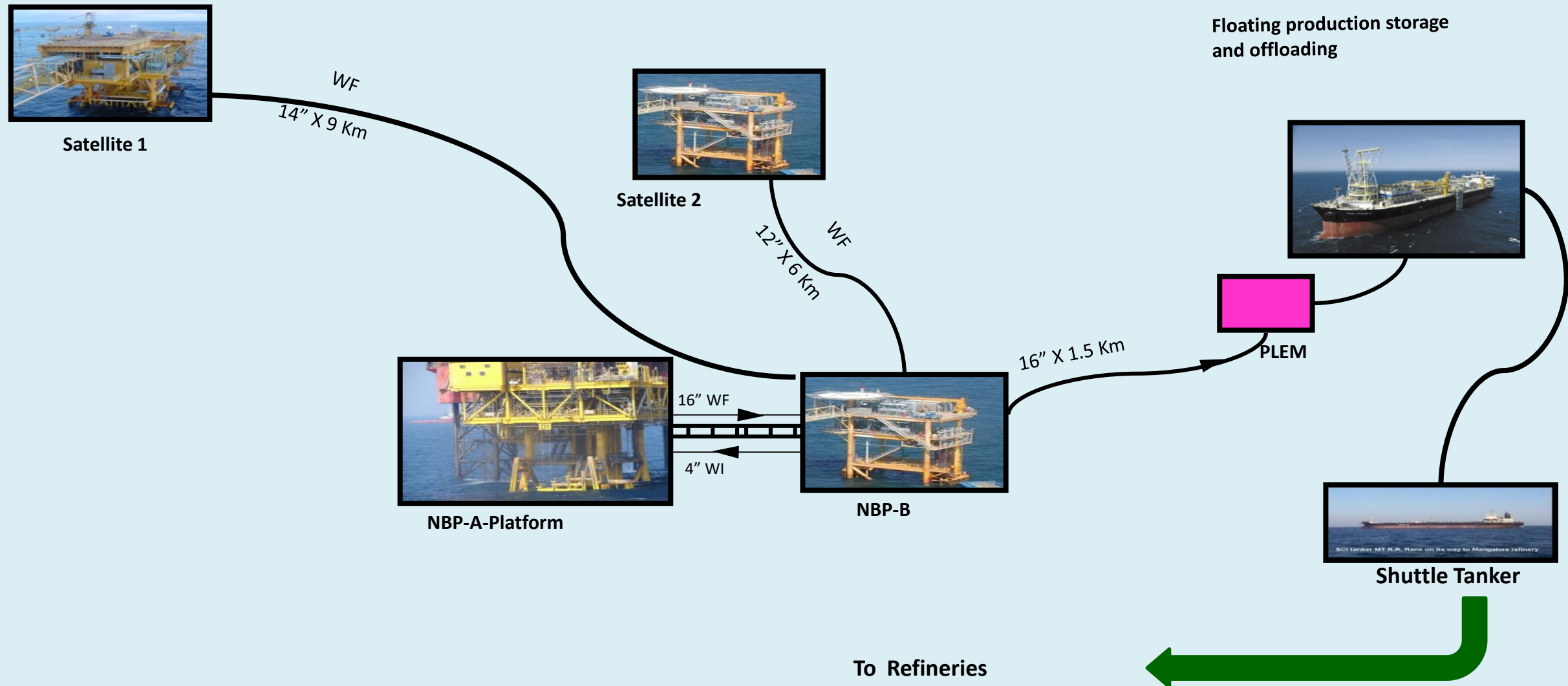
Semi Submersible Rig



A Typical Hi-Tech Well in Offshore



TYPICAL OIL PROCESSING AND EVACUATION SYSTEM



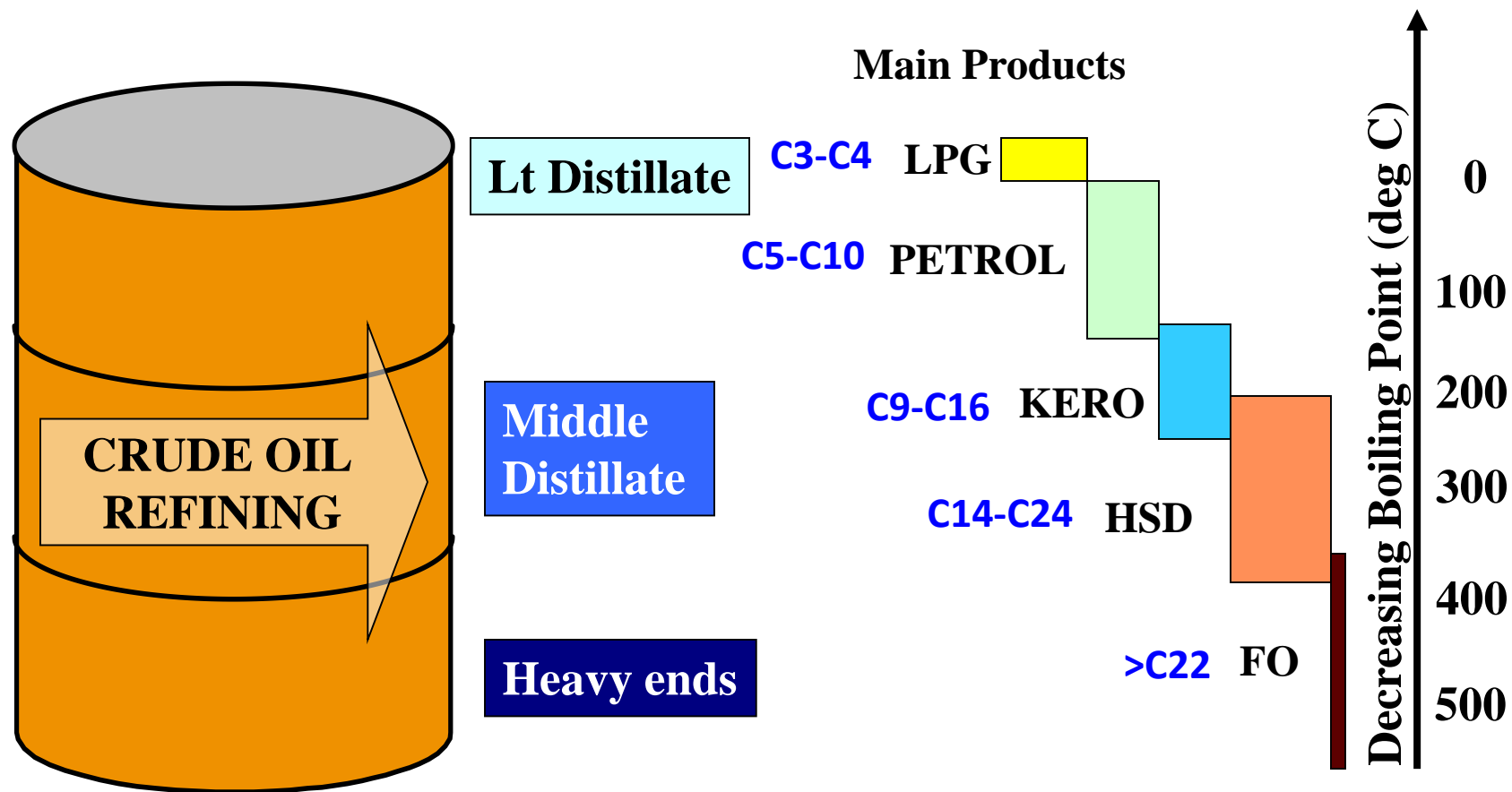
Monitoring of Refining Process



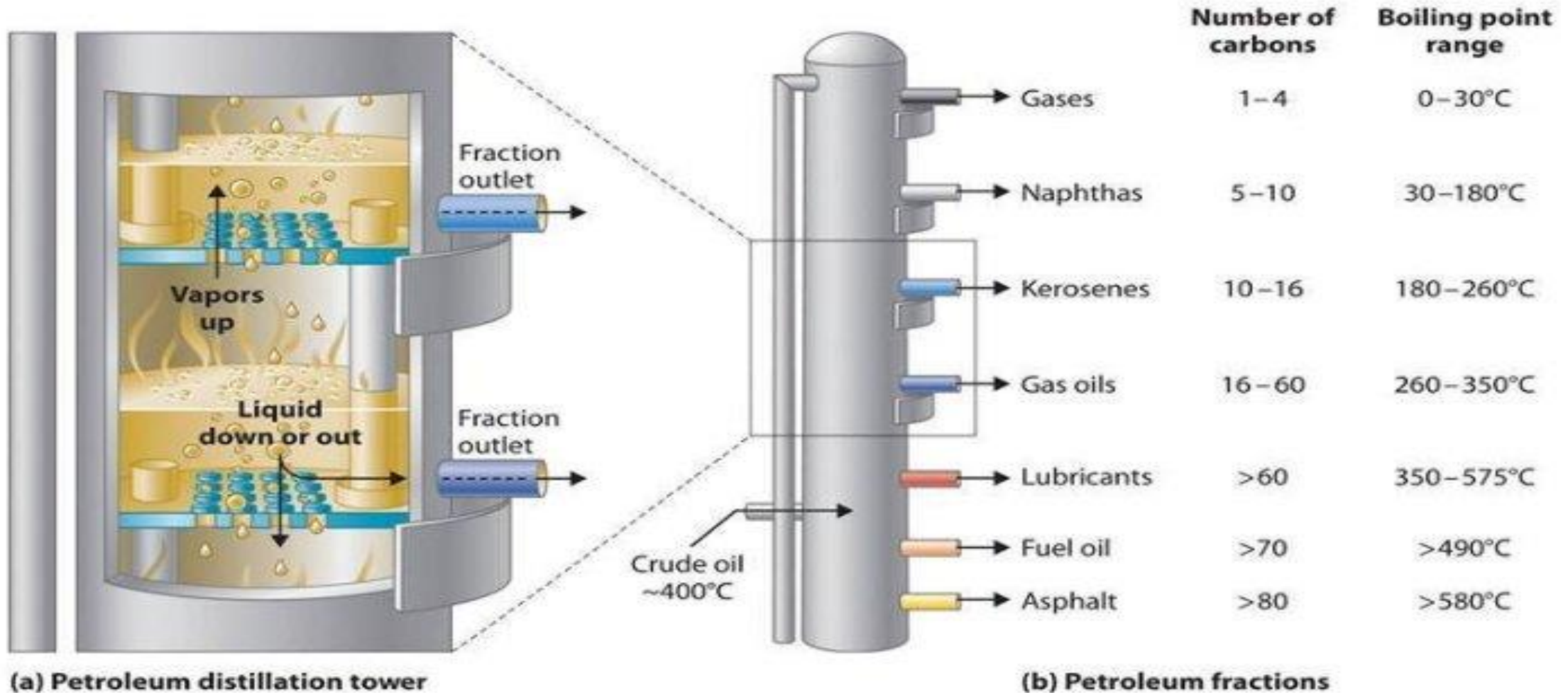
How crude is separated

- Crude oil contains hydrocarbons of varying carbon numbers. These different hydrocarbons boil at different temperatures and this property of the hydrocarbons is used to separate different products. The major products are LPG, Naphtha, Petrol, Jet Kero, Diesel and Furnace oil.
- The lighters like LPG boil between -30 deg C to $+2$ deg C while heavy ends start boiling only after 550 deg C. The other products boil between these two extremes.
- Crude oil is separated into different streams by Distillation which is the basic refinery process. The physical quantities of different products that can be separated by simple distillation process vary depending on the type of crude.

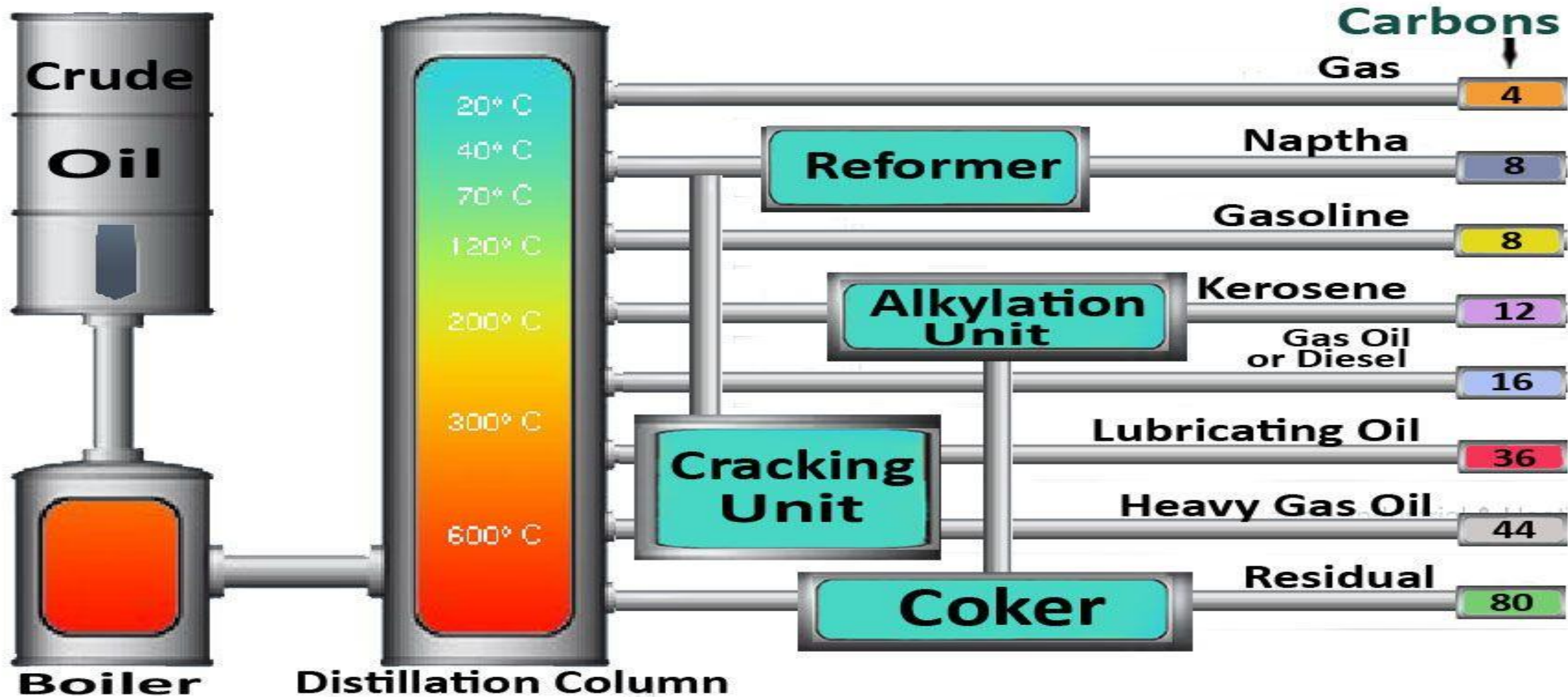
Crude oil to products



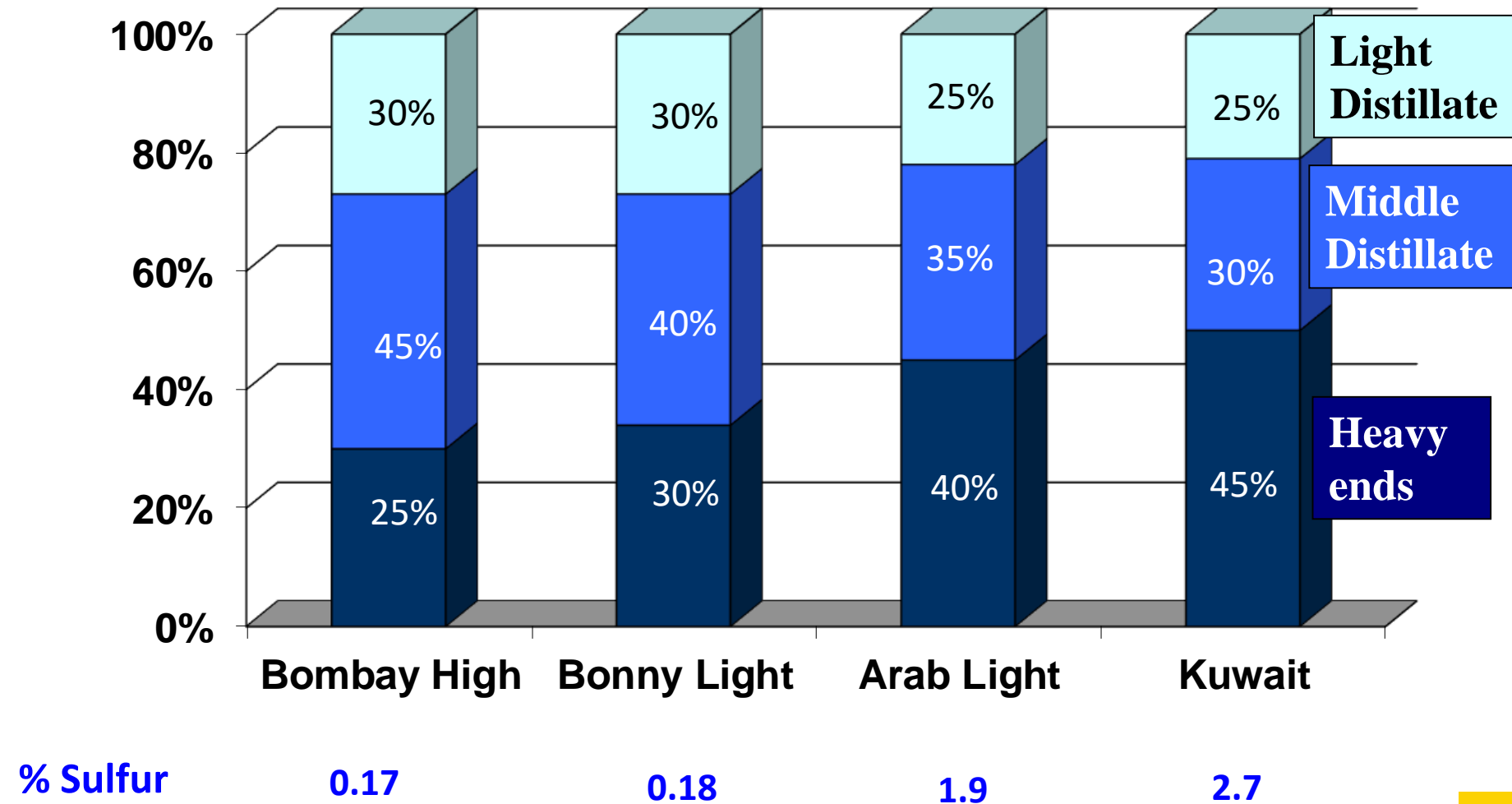
Basic Refining



Secondary processing



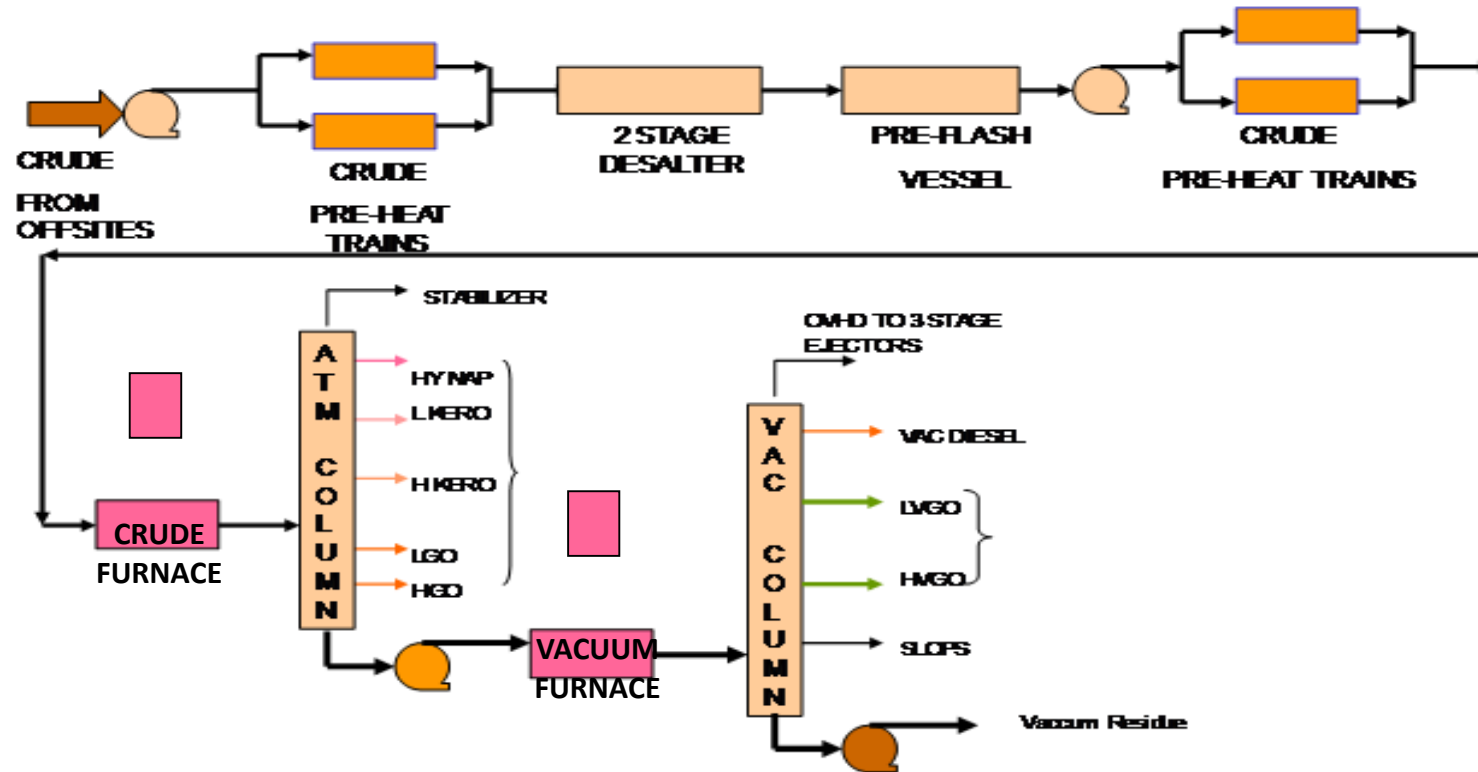
Different crude – different yields with simple distillation



Mumbai Refinery - Products

C3	NTPC NAP	HSD IV	BITUMEN
LPG	SKO	LDO	LSHS
PETROL	ATF	FO - 3	SULFUR
LAN	LABFS	BENZENE	LUBE OILS
HAN	KEROSENE	TOLUENE	MTO
NAPHTHA	NG HSD	SBP	
RIL NAPHTHA	HSD III	HEXANE	

Crude & vacuum distillation unit



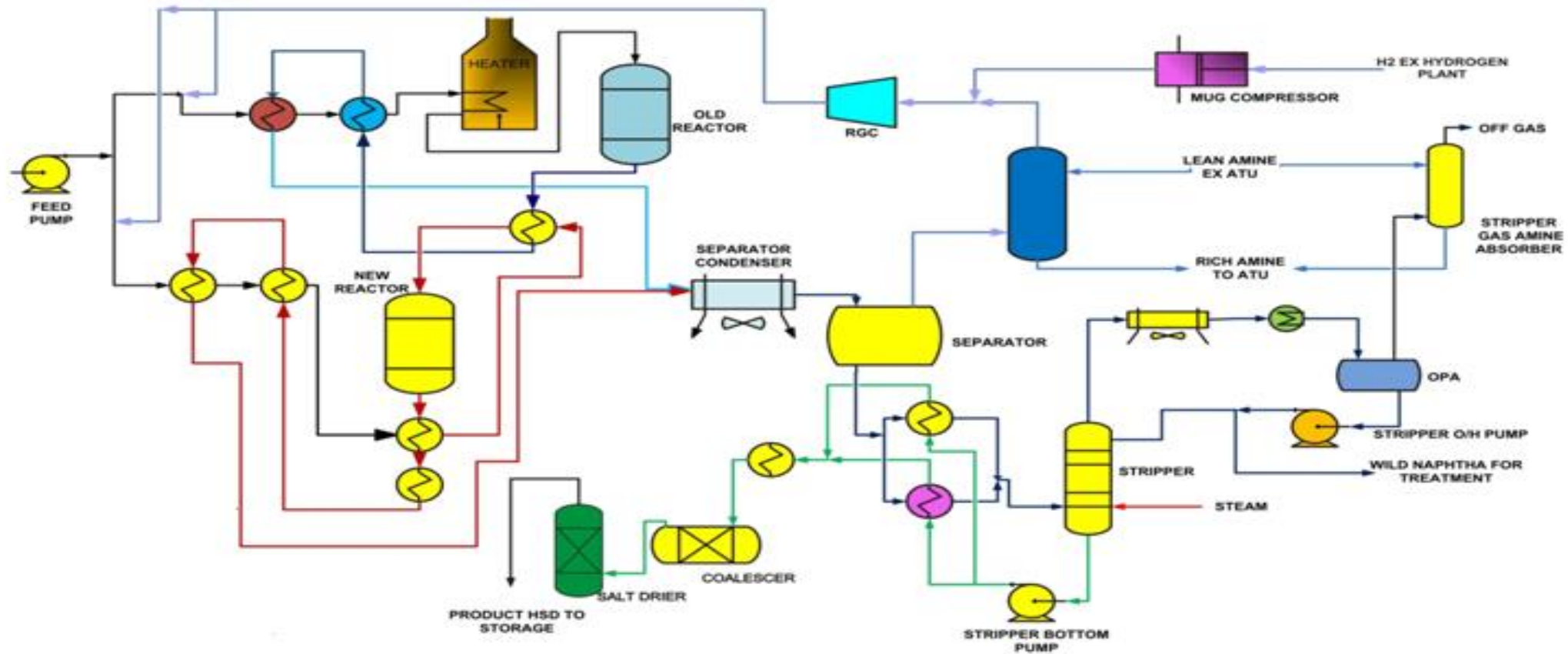
Audit to check optimum use of crude.

Maximum light and middle distillates and minimum heavy ends

Minimum Fuel and Loss

Crude Distillation Unit (CDU) separates crude oil into various fractions based on boiling points for further processing in downstream units

HDS

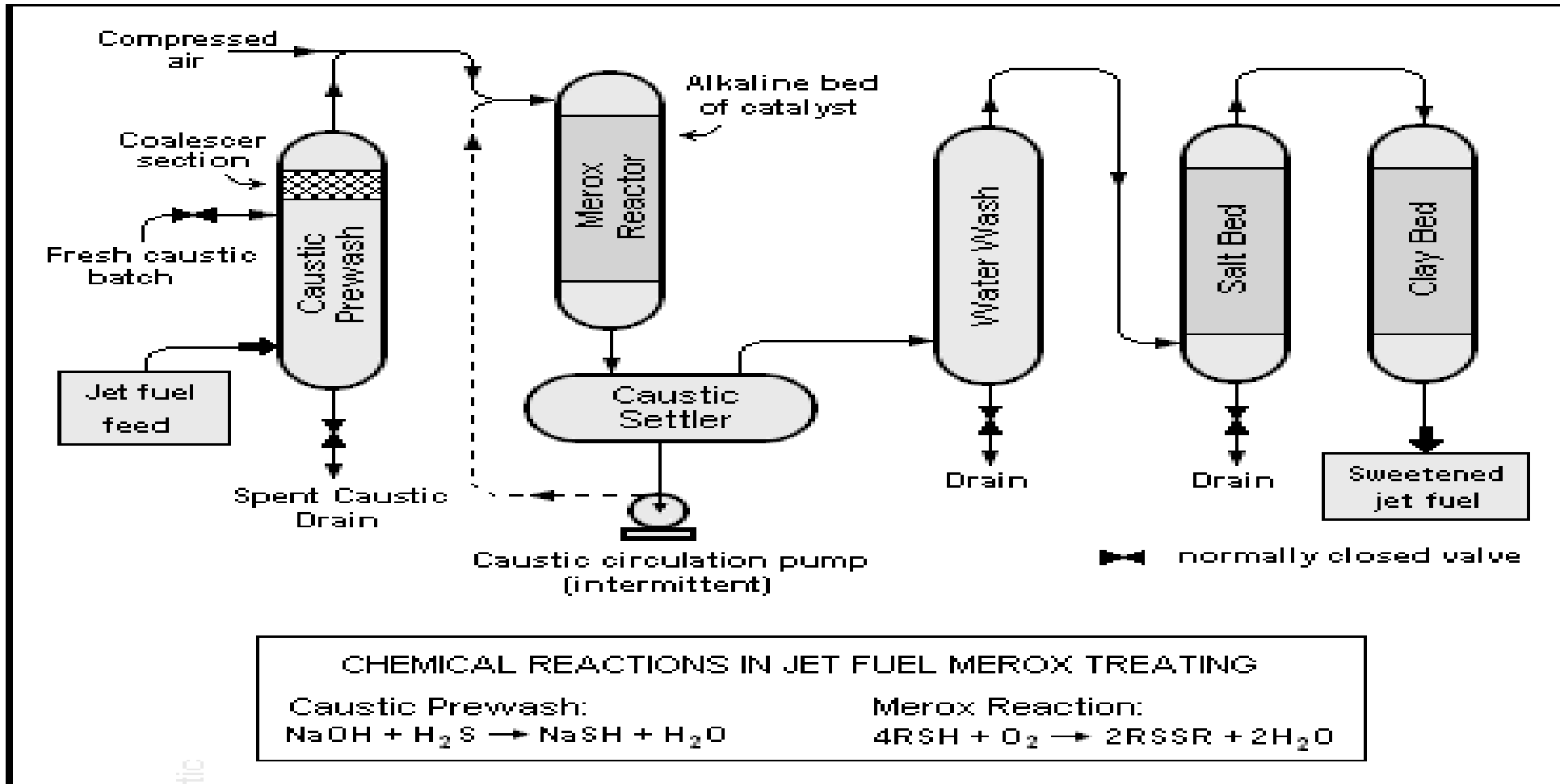


Audit to ensure products conforming to respective standards.

Minimum downgrades and rejections

Hydrodesulphurization (HDS) is a catalytic process used to remove sulfur (S) from petroleum products, such as gasoline , jet fuel, kerosene, diesel and fuel oils

KMU



KMU is Kero-Merox sweetening process used to remove sulfur (S) from jet fuel,

Audit to check frequency of rejection and downgradation of ATF to SKO.

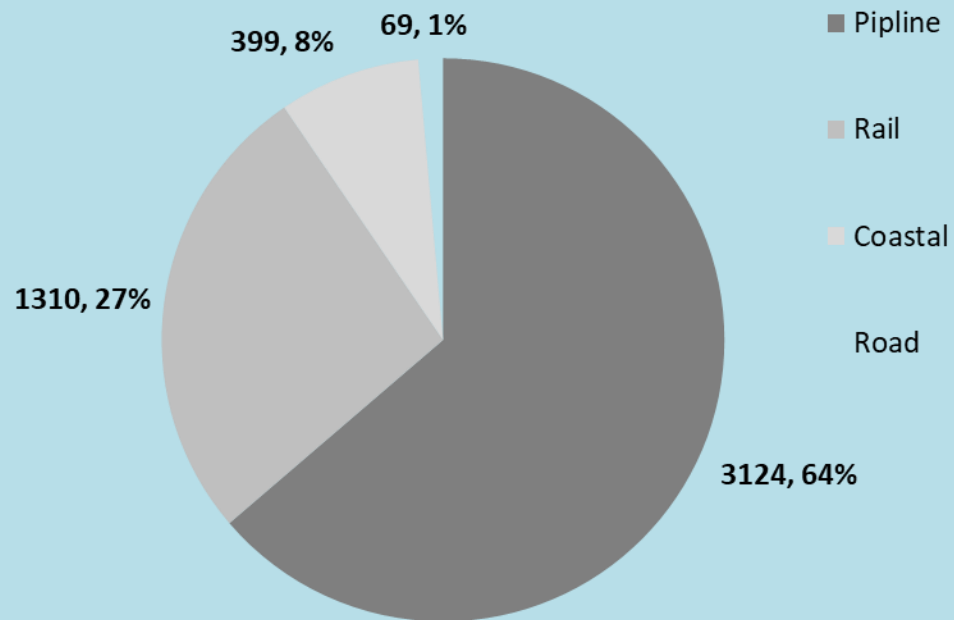
Downstream Petroleum Infra.

- Refinery (Production unit and Bulk Dispatch)(Crude coverage, Crude mix, Swing config., demand supply balancing, zero or minimum flaring, Refinery Gross margin maintenance, containment management, dispatch management, HSE policy, periodical maintenance, shutdown management etc.)
- Installations (Bulk receipts from Refinery and Tankers and storage)
(Receipt metering, storage management and accounting, Dispatch management).
- Depots (Receipts from Installations and Local storage and distribution).
- Storage depots in the premises of large customers.
- Retail Outlets (Last mile delivery points).
- LPG Bottling Plants (Bulk processing unit).
- LPG Distributors (Last mile delivery point).
- Lube oil plants.

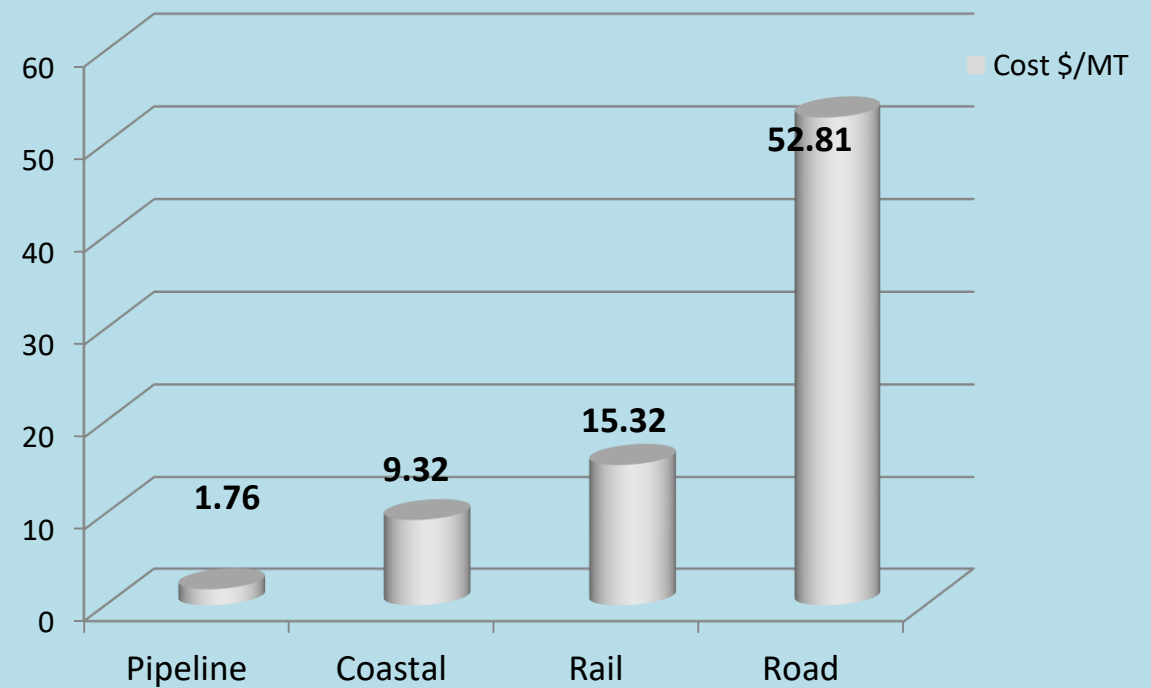
Modes of transport

Modes of primary transportation – Pipelines, Coastal, Rail and Road

**POL products transported by various modes
(Quantity in TMT, percentage)**



**Average cost of transport of POL Products by various
modes**



Audit checks in Storage and transportation

- Fixed roof tanks (for heavy products) Vs. Floating roof tanks (for light products to minimize evaporation loss)
- Calibrated meters at both the ends (Dispatch and receipts).
- Contract should have a clause as to which meter to depend.
- Water content and other external elements to be sampled at both ends.
- Pipelines to be maintained and pigged frequently.
- Pilferage and spillage to be monitored.
- Safety measures to be adopted.
- Ensure to have a plan for zero dry outs.
- Ensure product coverage of 45 days (plus Crude coverage of 45 days) to be eligible for Energy Security.
- Reconcile unconnected Tank Wagons with Railways frequently.
- Downgrading of ATF to SKO to be monitored and reasons analyzed.

Further Audit checks in Pricing

- Existence of a sound and transparent pricing policy (Pricing based on Import Parity Price in India).
- Increased cost of production reduces margin (RGM and MM) as ceiling is fixed.
- Discount to bulk customers to be based on demand-Supply balance and unbiased.
- Pricing to be approved by the competent authority.
- Royalty and Cess to be assessed and paid correctly and timely.
- Recovery of dues to be monitored.
- Credit policy to be reviewed.

Scheme of Presentation

- ☐ Introduction to Extractive Industries (3-4)
- ☐ Crude Oil (5)
- ☐ Quick recap of E&P activities – E&P cycle, survey, data analysis and sequencing, Rigs, drilling, oil processing and evacuation (7-13)
- ☐ Refining process (14-26)
- ☐ Downstream Infra. (27)
- ☐ Modes of transport of petroleum products (28)
- ☐ Audit checks in downstream (29-30)
- ☐ Solid Minerals, Mining cycle (32-36)
- ☐ Legal Framework in India (37)
- ☐ Prospecting and Mining Lease (38)
- ☐ E Auction (39-40)
- ☐ Role of Audit and Audit Report of SAI –India (41-44)
- ☐ Illegal mining (45)
- ☐ Best practices (46)

Solid Minerals

TYPES OF MINERALS

MINERALS

METALLIC

NON-METALLIC

ENERGY MINERALS

FERROUS

Iron ore, manganese, nickel, cobalt etc.

NON-FERROUS

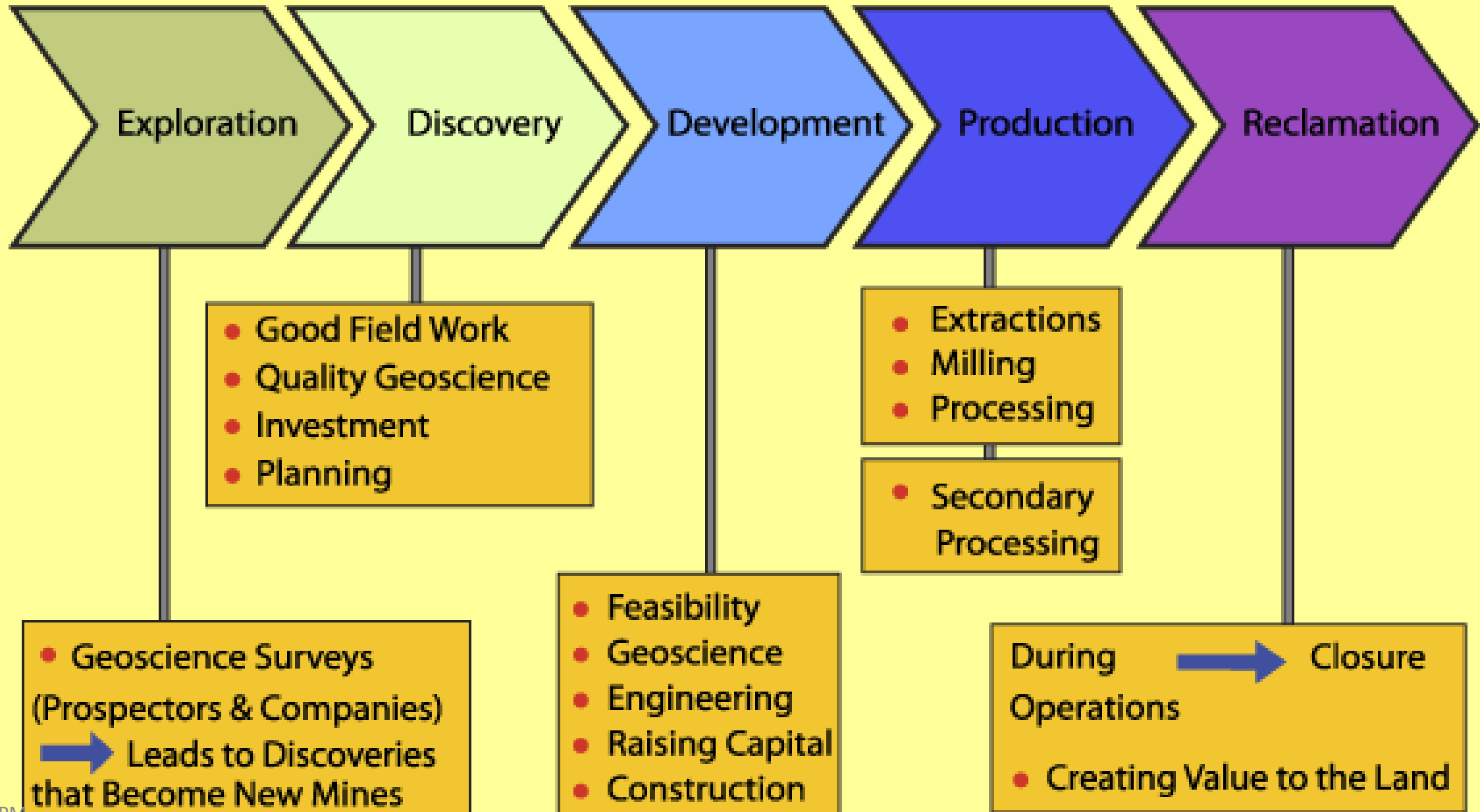
Copper, Lead, tin, bauxite etc.

PRECIOUS

Gold, silver, platinum etc.

Mica, salt, potash sulphur, granite, limestone, marble, sandstone etc.

Coal, petroleum, natural gas



Live Mine



Live Mine



Legal Framework on Mineral Mining in India

- **Mines & Minerals (Development & Regulation) Act, 1957 (MMDR Act 1957 amended in 2015, 2020 and 2021)**
- 10 Rules governing various activities
- National Mineral Policy
- Under MMDR Amendment Act **2015, E-Auction was made mandatory** for the grant of mineral concession to ensure transparent method of allotments of mineral wealth.
- Other salient features of the amendment were removal of requirement for various approvals under **Ease of Doing Business**, Creation of District Mineral Foundation Trust for the welfare of mining affected areas by using contributions from the mining companies, **stringent penal provisions to deter illegal mining** activities like provision for higher penalties and imprisonment up to 5 years. Constitution of special courts by the State Governments for fast-track trial of cases of illegal mining.

Steps in E Auction - Coal

Intrinsic value of coal is established before bidding and Reserve Price is fixed

Nodal Agency appointed (Metal Scrap Trading Corporation Limited) (MSTC)

Bidding in Stage-I and Stage-II

Stage-I – Physical submission in Two bids. Technical and Financial envelops

Technical bid evaluated first to shortlist based on Tech criteria

If qualified in Technical bid, Financial bid envelop is opened.

Bids lined up in descending order – Highest bid first and so on.

From the above, first 50 per cent or 5 bids, whichever is higher, is made qualified for Stage-II

Stage-II (e-auction)

Max value in financial bid is reserve price

E- auctioneers to bid in multiples of Rs 2 at each stage above the displayed price

E Auction – Coal ...contd...

- Preferred bidder is sent to Ministry of Coal for approval as successful bidder.
- Execution of the Coal Mine Development and Production Agreement (CMDPA) by Nodal Agency with the successful bidder
- Issue of vesting Order after payment of dues by the successful bidder (for the value of land and mine infrastructure, cost of preparation of geological report, cost of obtaining all statutory licenses, permits, permissions, approvals, clearances or consents relevant to the mining operations, transaction expense (collectively the ‘fixed amount’), performance security and the first installment of upfront amount)
- Issue of Mining Lease.
- In 2020, the bidding system for fully/partially explored blocks was changed on Revenue sharing model with 4 per cent as the basis point with 0.5 percent as incremental bid till the percentage reaches 10. Beyond 10 per cent, the incremental bid tranche is 0.25 per cent.

Prospecting and Mining Leases

- Prospecting Licence not beyond 25 sqkm.
- Prospecting period 3 years plus extension of another two years
- Reconnaissance licence not beyond 10 thousand sqkm.
- Mining Lease to be Min. of 20 years and Max. of 30 years at the first instance. Renewal could be for further 20 years.
- Royalty/Dead Rent (minimum guaranteed royalty) to be paid as per scheduled rate.

Role of Audit in bidding and post bidding

To ensure that:

- The bidding process is fair and transparent.
- Interest of the Government is well taken care.
- Production figures are not under reported. (May impact Govt. revenue and Royalty).
- Pricing of products is based on the Grade and Formulae. (May impact Revenue Sharing).
- Royalty is paid to Government at correct rate on timely basis.
- Mine closure plan is in place and there are funds earmarked for the same. (Normally, capitalisation should include this cost too, so that closure cost is recognised in the initial stage itself).
- Quantum of Depreciation to have a direct bearing on the reserve.
- CSR initiatives and sufficiency of Funds.
- No collateral damage to the Environment- Sustainable Development Policy in place.
- HSE Policy is in place and are implemented strictly.

Extracts from SAI India's Report on Allocation of Coal Blocks and Augmentation of Coal Production 2012

<https://cag.gov.in/en/audit-report/details/1837>

- As against the recommended 1.5 million drilling meterage per annum, the capacity achieved was only 0.34 million meters.
- Underachievement of production targets.
- New Coal Distribution Policy 2007 envisaged priority supply to small and medium consumers. But, no monitoring mechanism put in place to ensure implementation of policy.
- New captive coal blocks to be allotted with a reasonable distance. However, some of the blocks allotted were very near, which resulted in a large reserve of (48 million tonne) Government blocks inaccessible with further consequence of reducing the life of the mine from 24 to 20 years.

SAI India's Report... contd...

- Production from underground mines stagnated at 43 million tonnes between 2006 and 2010, which came down further to 40 million tonne in 2011 (9.28 per cent decrease).
- Recorded minutes of meeting of Screening Committee to show how the blocks were allotted were not available, which indicated lack of transparency.
- Windfall gain by captive allottees were observed and bidding was recommended for such allottees also in 2004. Till 2012, the modalities were not finalised.
- Mean time, 142 blocks were allotted in conventional method till notification of the amendment to MMDR Act on 2 February 2012.
- The delay caused an estimated undue gain to the private allottees to the extent of Rs 1860 billion (\$ 24.8 billion at current exchange rate)
- 83 captive mining blocks were to produce 73 million tonnes by 2011. However, only 28 had commenced production to the extent of only 34.64 million tonnes.

SAI India's Report... contd...

- Abnormal delays in obtaining Mining Lease, surface rights, land acquisition, rehabilitation and resettlement, obtaining Forest clearance etc. caused delayed production by captive mines.
- Coal Controller's Organisation, which is authorised to enter any mine and inspect, failed to conduct any physical inspection, rendering whole dependency on the data furnished by the allottees.
- Monitoring Committee (MC) met only in a quarter, instead of monthly, indicating lack of monitoring.
- MC adopted (2005) Bank Guarantee to safeguard Govt.'s interest against delayed production. However, it could not encash the BG submitted by 15 out of 24 allottees till 2011 due to the modalities of encashment not been decided. As of November 2011, The expired BG stood at Rs 31.18 million.

Illegal Mining

- Very rampant and not generally accounted for.
- An occupation limited to the source.
- Very ill organised and unscientific.
- Does not take Environmental issues seriously.
- No sustainable development concept- Asset damage.
- No taxes and levies to Government.
- Lots of social issues (Child labour, safety, security, gender, human rights abuse, Groups and clashes, illiteracy, exploitation, slavery and bonded labour).

Best practices

- Better regulation.
- Community involvement.
- Restoration provisioning at the beginning.
- CSR compliance.
- Environmental and social cost accountability.
- Recycling of water to the extent possible.
- Effluent discharge after treating.
- Site restoration to its original state.



Thank You
nairmk@cag.gov.in
From SAI - India

