IMIDRO
IRANIAN MINES AND MINING INDUSTRIES DEVELOPMENT AND RENOVATION ORGANIZATION

IMIDRO Petroleum Coke Project

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Contents

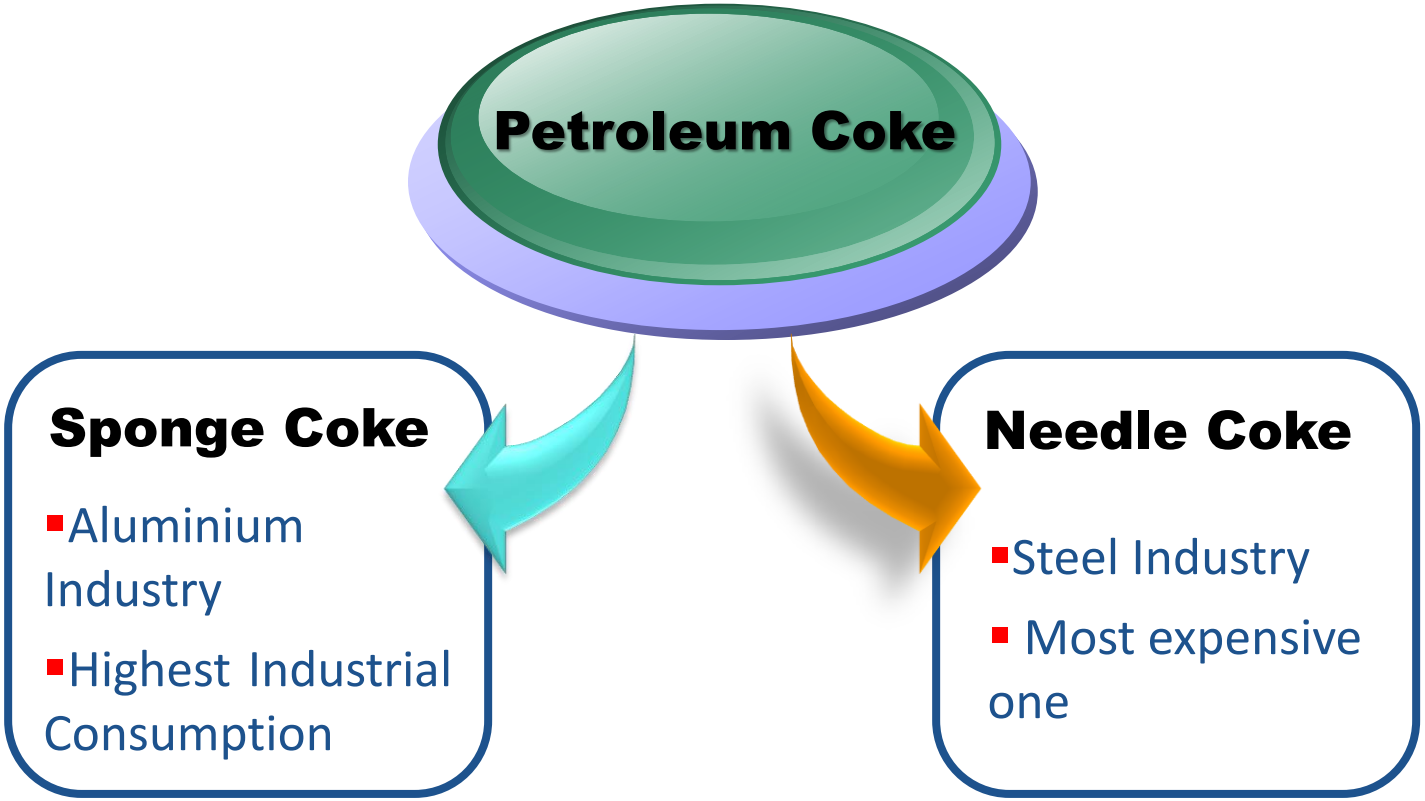
IMIDRO at a glance

- Iranian mines and mining industries development and renovation organization possesses 8 major companies and 55 operating companies.

- This organization is the holding of Iranian mining industries and mines producing annually 457 thousand metric tons of Aluminum, 14.5 million metric tons of steel, 215 thousand metric tons of copper and more than 50 million metric tons of mining products.

- Regarding the consumption of 190 thousand metric tons of petroleum coke in Aluminum and steel industries of IMIDRO this project has been introduced to meet the needs of Iranian industries.

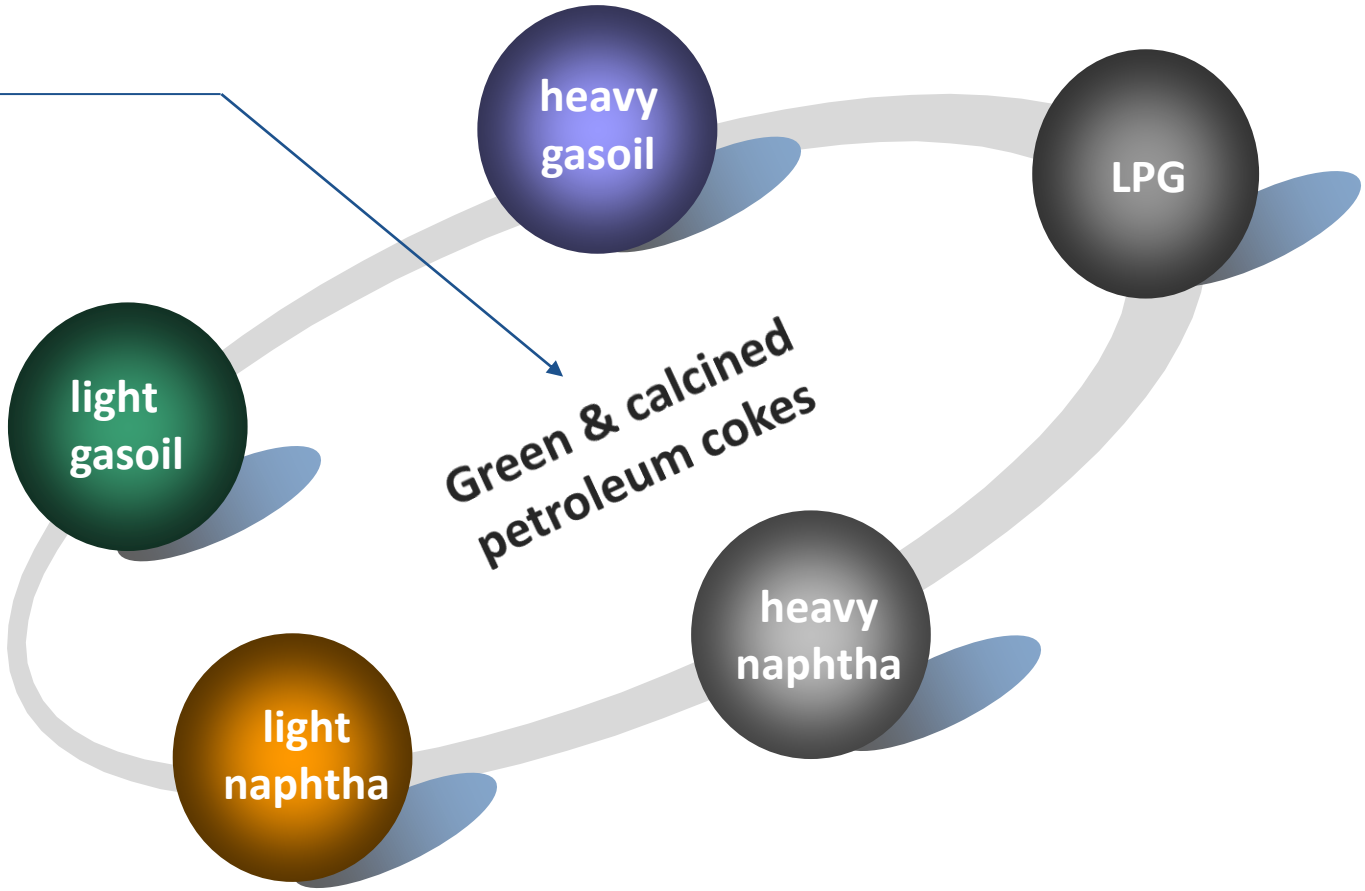
Product Introduction- Project goal



- **The goal of our project is producing Sponge Coke**

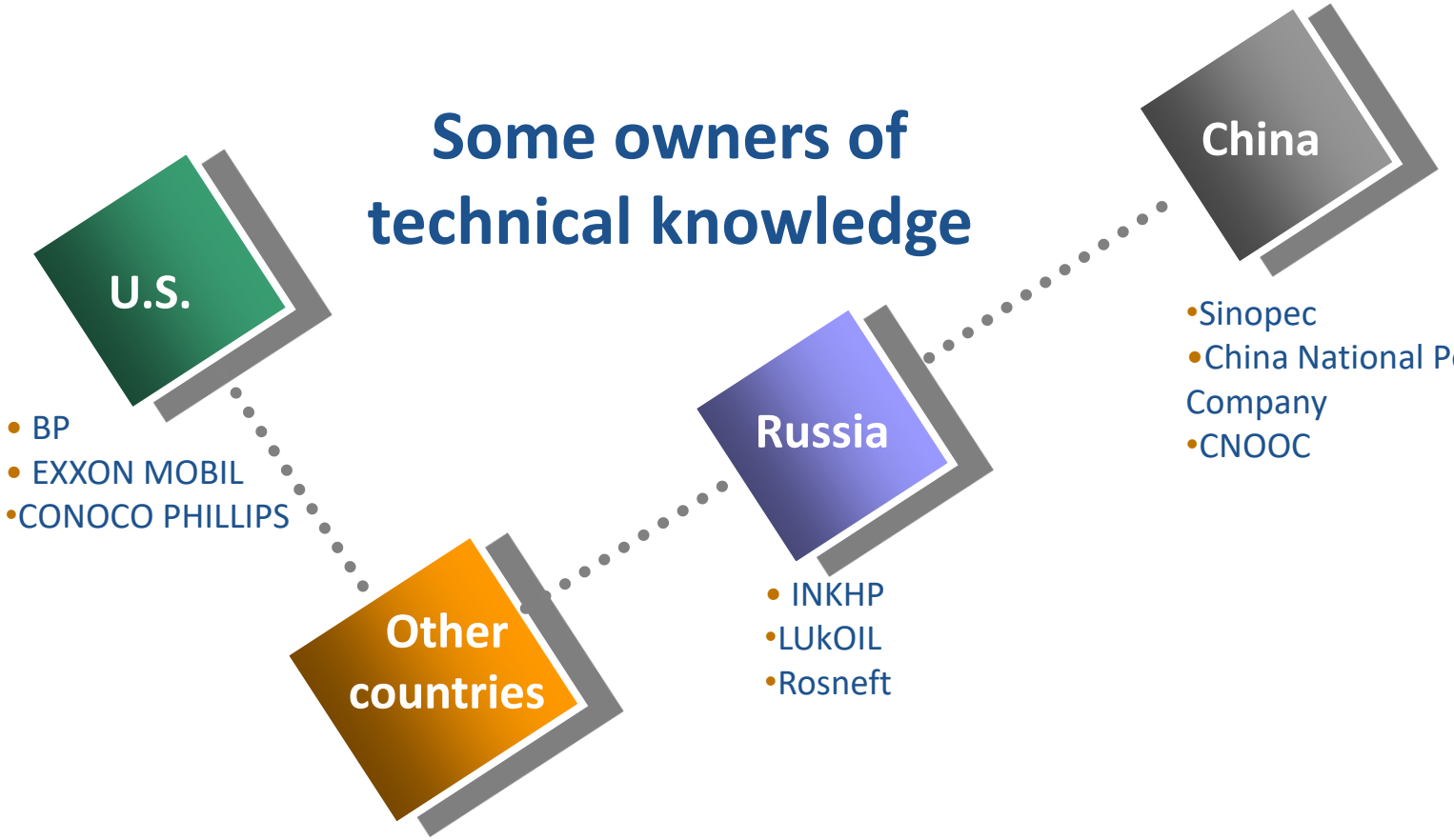
Product Introduction

Raw Materials: Vacuum bottom of oil refineries with the followed specification.



Technical Analysis

Some owners of technical knowledge



- BP
- EXXON MOBIL
- CONOCO PHILLIPS

- Sinopec
- China National Petroleum Company
- CNOOC

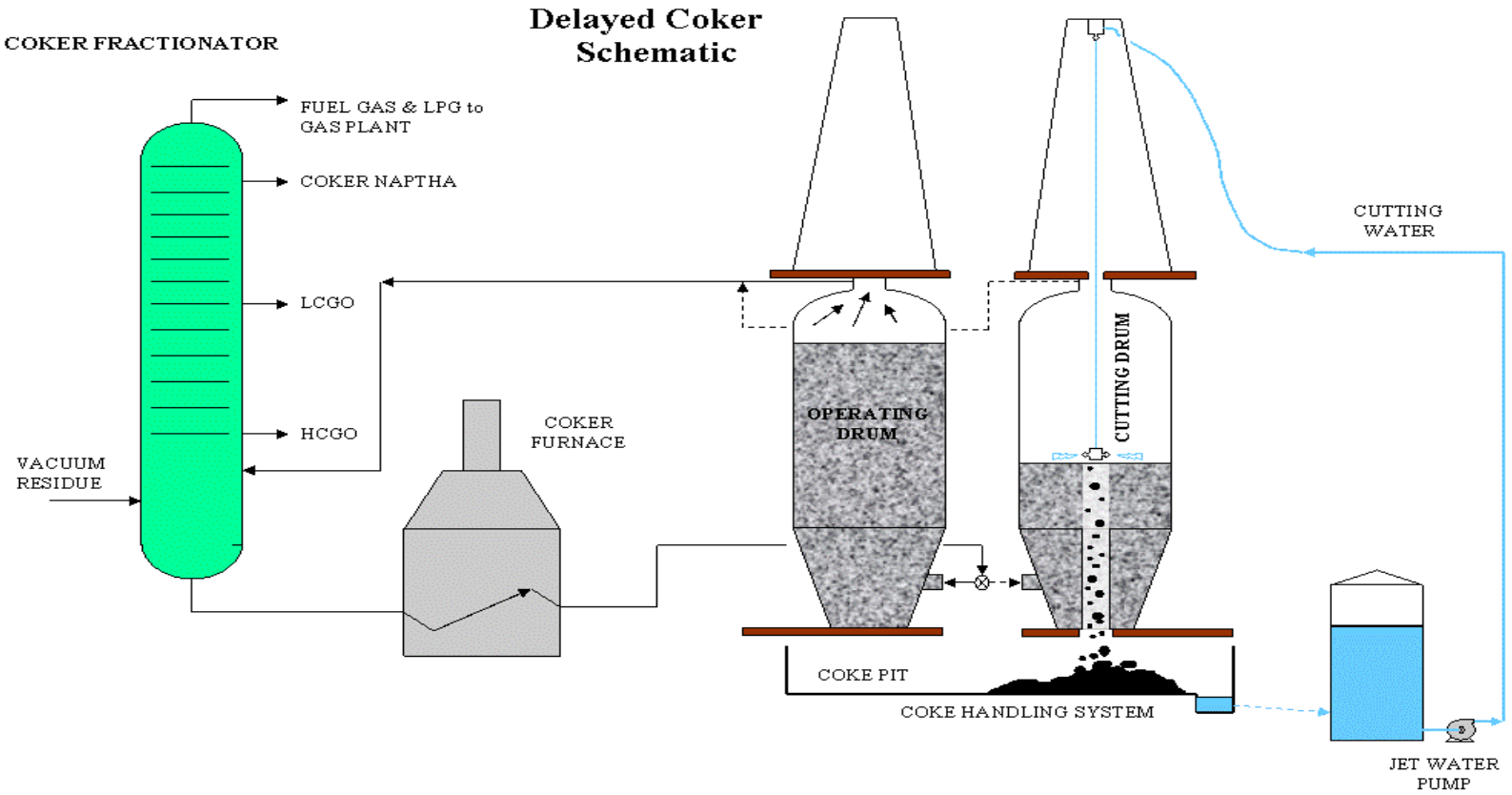
- INKHP
- LUkOIL
- Rosneft

- Miro(Germany)
- Petrobras (Brazil)
- Paraguana Refining Orinoco Belt Upgraders (Venezuela)
- AgipPetroil (Italy)
- JK Nippon Oil and Energy Corporation (Japan)

Technical Analysis- Production Process

- Depending on the feed treatment, the amount of products will be changed.
- Our goal is to maximize the petroleum coke production without neglecting project profitability.

Technical Analysis-Delayed Coker unit schematic



Technical Analysis- The main specification of the available feeds

Test Name	Standard	Range
Specific Gravity@ 25/25◦C	ASTM D 3289	1.004-1.032
Kinematic Viscosity @ 100◦C, cSt	ASTM D 2170	572-4639
Kinematic Viscosity @ 135◦C, cSt	ASTM D 2170	107-430
Softening Point,◦C	ASTM D 36	32-52.5
Pour point	ASTM D 97	> 40
Penetration @ 25◦C, 0.1 mm	ASTM D 5	39-365
Conradson Carbon Residue, mass%	ASTM D 189	17.41-22.86

Technical Analysis- The main specification of the available feeds

Test Name	Standard	Range
H Content, mass%	ASTM D 5291	9.9-10.4
N Content, mass%	ASTM D 5291	0.7-0.5
S Content, mass%	ASTM D 4294	3.35-4.42
Asphaltene, mass%	SARA Test	4.3-13.1
Asphaltene/CCR		0.25-0.57
Resin , mass%	SARA Test	22.3-24.8
Aromatics , mass%	SARA Test	44.8-50.1
Saturates, mass%	SARA Test	17.3-23.3
Vanadium (V), ppm	ASTM D 5863	130-245
Nickel (Ni), ppm	ASTM D 5863	34-73
Iron (Fe), ppm	ASTM D 5863	2-3

Technical Analysis- The required specifications of anode grade petroleum coke (green and calcined coke)

Property	Green coke	Calcined coke
Water Content wt%	0.5 - 2.0	0.0 – 0.2
Oil Content wt%	0.1 - 0.3	0.1 – 0.3
Dust forming factor wt%	NA	0.002 – 0.010
Ash wt%	0.04 – 0.5	0.1 – 0.2
Volatile Matter wt%	5 – 15	0.2 – 0.4
Fixed Carbon wt%	85 – 95	98 – 99
Hydrogen wt%	2.0 – 5.0	< 0.1
Sulfur wt%	0.2 – 4.0	0.5 – 3.5
Nitrogen wt%	0.1 – 0.5	< 0.1
Iron ppm	50 – 400	50 – 400
Nickel ppm	50 – 200	50 – 220
Vanadium ppm	30 – 300	30 – 350
Real Density kg/dm3	1.5 – 1.8	2.05 – 2.10
Bulk Density kg/dm3	0.65 – 0.80	0.78 – 0.84
Hardgrove index HGI	30 - 38	NA

Technical Analysis- Project location

Quality of feed

- S Content, mass%
- Asphaltene /CCR
- Aromatics , mass%
- Vanadium (V), ppm
- Nickel (Ni), ppm

Environmental effects

- Proximity of the countries exports
- Being close to the sea, railway lines and airports
- Appropriate infrastructure
- Yet experts
- Etc.

Feed capacity

- Production capacity feed
- Possible assignment of coke
- private or state refinery

Proximity to internal markets

- Being close to the calcination unit
- Being close to the petrochemical industry
- Capacity of accepting lateral products
- Proximity of the aluminum industry
- Being close to the graphite electrode production unit

Technical Analysis- Location of proposed projects

- Result of location analysis by ranking and AHP method :

Technical Analysis- Infrastructure

Infrastructure provision	Distance to the project location	Infrastructure needed
Available	The site is located	Water
Available	The site is located	Power
Available	The site is located	Gas
Available	The site is located	communication
Available	In the vicinity	Main Road
Available	Available	Roads
Available	**10 km**	Airport
Available	**5km**	Port
Available	**5km**	railway station

distance of project from different center (m)	The minimum allowable distance (m)	Different centers	
8000	2000	City	Settlements
4800	1500	Village	
5000	1500	Treatment and Education Centers	
5000	1500	Military centers	
13000	2000	National Park - wetlands - lakes - the natural result of national	
-	1000	Wildlife - Protected Area	
2500	750	Permanent rivers	
-	250	Canals and wells	

Economic Aspect

❑Principles and assumptions of the economic analysis:

Item	Description
The amount of bank loans	70% of the total investment in the project
The amount of cash	30% of the total investment in the project
Tax	%25
Plan of Operation	25 years
Construction period	4 years
Work flow coefficient	0.96
Discount rate	%15
Depreciation	15-year linear method
Residual value	%20
Interest rates on loans	%10
Loan conditions	4 year (fixed payment method)
Repayment of loans	Six-year breathing period of 4 years (construction period)
Base price of feed and products	Average prices, fob Persian Gulf 2009-2021
Factory service rates in the first year of operation	%90

Economic Aspect

- The economic indicators will be as the following table.

Internal Rate of Return (IRR)	25.71%
Internal Rate of Return Equity (IRRE)	30.68%
Net Present Value (NPV)	417.53
Number of Payback Period (NPP)	3 years

Goals and Conclusion

❖IMIDRO plans to perform the construction of petroleum coke plant in two phases:

❑Firstly a license and Process Design Package (PDP) will be performed by the selected reputable licensor and then

❑ EPC project should be done based on the provided PDP.

Both steps can be included in one Invitation for Bid or separately based on the information of prequalification's. Technical consultancy services about all mentioned subjects are on the base of Research Institute of Petroleum Industry (RIPI) duties.

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