



Mini Crude Oil Refinery Feasibility Study

Prepared by: Blackstone International -

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Executive Summary

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This concept is particularly suitable for regions with limited oil reserves. To address fuel supply challenges, Pakistan has small oil reserves scattered across almost every province. Several oil and gas reserves in Pakistan have not been utilized properly due to unfavorable geographical conditions or the relatively small amount of these resources.

Establishing a mini crude oil refinery in Pakistan can be a viable venture, considering the country's small reserve of crude oil. This report assesses the feasibility of such a project, focusing on technical and economic aspects.



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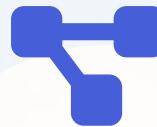
Technical Feasibility

Technical Feasibility



Refinery Capacity

A mini refinery with a capacity of 200 barrels per day can be a suitable starting point, allowing for flexibility and adaptability in operations.



Production Process

The refinery can employ a straightforward approach, incorporating a Preheater, Pre-Flash Distillation Unit, Atmospheric Distillation Unit, and Vacuum Distillation Unit to minimize capital costs.



Product Range

The refinery can produce various petroleum products, such as diesel, petrol, and furnace oil, catering to domestic demands.

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Economic Feasibility

Economic Feasibility

1 Capital Cost

The estimated capital cost for the mini refinery is around PKR 400 million, considering the cost of equipment, land acquisition, and other expenses.

3 Payback Period

The payback period for the investment is approximately 3.5 years, indicating a relatively short-term return on investment.

2 Operational Cost

The operational cost is estimated to be around PKR 50 million, covering expenses such as buying raw material, labor, maintenance, and utilities.

4 Break-Even Point

The break-even point is around 18%, suggesting that the refinery needs to operate at nearly one-fifth of its capacity to cover costs.

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Market Analysis

Market Analysis



Demand

Pakistan's demand for petroleum products is increasing, driven by economic growth and industrialization.



Competition

The refinery sector in Pakistan is evolving, with existing refineries upgrading their facilities to meet Euro V specifications and maximize production of high-demand products like diesel and petrol¹.

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Process Selection and Description

Process Selection and Description

Crude oil's low selling price due to its limited direct usability necessitates refining into valuable products. Oil refineries play a vital role in this process, offering various configurations ranging from simple to complex.

For small-scale refineries, simplicity and minimal capital costs are key to profitability. A topping refinery configuration, focusing on separation and distillation, is considered the most suitable and profitable option. This setup produces intermediate products with relatively modest revenue.

To ensure economic viability, minimizing refinery costs is crucial. Optimizing equipment design, such as heat exchangers and pipelines, can help reduce costs and achieve a more compact design. By streamlining the process and minimizing expenses, small-scale oil refineries can operate efficiently and effectively.

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Dependency

Dependency

The establishment of an oil refining unit in Pakistan would heavily rely on locally available technical expertise and resources. Leveraging local talent and skills would not only reduce costs but also ensure that the refinery's operations are tailored to the country's specific needs and conditions. Local technical expertise in areas such as process engineering, maintenance, and operations would be crucial for the refinery's success.

Additionally, access to local resources, including equipment suppliers, contractors, and logistics providers, would facilitate the construction and operation of the refinery, minimizing reliance on foreign expertise and reducing costs. By tapping into Pakistan's existing pool of technical expertise and resources, the oil refining unit can ensure a smoother startup, more efficient operations, and better adaptability to local market conditions.

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Favorable Aspects

Favorable Aspects

Small-scale oil refineries offer several benefits, including ease of quality control, flexibility in feedstock selection, and adaptability to varying crude oil types. With a smaller setup, it's simpler to monitor and maintain product quality, as well as control the formulation of feed raw materials. Additionally, small refineries can accommodate a wide range of crude oil types, from light to sour crude, and even those with high sulfur content. This flexibility allows for:

- 1 Easy quality control: Monitoring and maintaining product quality is more manageable in a smaller refinery.
- 2 Feedstock flexibility: Different types of crude oil can be fed into the system, depending on availability and market conditions.
- 3 Adaptability: Small refineries can adjust to changes in crude oil supply and product demand more easily.
- 4 Cost-effectiveness: Smaller refineries typically require lower capital investments and operating costs.
- 5 Local market focus: Small refineries can cater to local market needs, reducing transportation costs and enhancing supply chain efficiency.

These advantages make small-scale oil refineries an attractive option for meeting local energy demands while optimizing resource utilization.

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Conclusion



Conclusion

Based on the technical and economic analysis, a mini crude oil refinery appears to be a feasible venture in Pakistan. However, it's essential to conduct thorough market research, assess competition, and ensure compliance with regulatory requirements.

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Recommendations

Government Support

Seek government incentives and support for small-scale refineries, as outlined in the Pakistan Oil Refining Policy for New/Greenfield Refineries, 2023.



Pakistan Oil Refining Policy 2023

For New/Greenfield Refineries aims to attract investment and modernize the refining sector through fiscal incentives and regulatory support. The policy encourages the establishment of new, state-of-the-art refineries, including those with petrochemical production, and promotes the production of Euro V-compliant fuels while minimizing furnace oil output. The policy also seeks to reduce reliance on imported refined products by incentivizing investment in the upgradation and modernization of existing refineries.

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Table 1-

Production Cost/Liter

Production Cost/Liter

S.No	Item description	Unit	Qty	Price	Total Amount	Production/day litter	Production cost / litter
1	<i>Heating expense by furnace oil burner</i>	litter	3000	130.00	390,000.00		
2	<i>Electricity for plant (24 hours)</i>	Unit	1200	85.00	102,000.00		
3	<i>Electricity for office (24 hours)</i>	Unit	600	85.00	51,000.00		
4	<i>Chemical for laboratory and quality control</i>	Ton	1	100,000.00	100,000.00		
5	<i>Genral manager</i>	500,000.00	1	16,666.67	16,666.67		
6	<i>Production manager</i>	300,000.00	3	10,000.00	30,000.00		
7	<i>Control room operator</i>	100,000.00	8	3,333.00	26,664.00		
8	<i>Accountant</i>	75,000.00	1	2,500.00	2,500.00		
9	<i>Mechanical supervisor</i>	150,000.00	4	5,000.00	20,000.00		
10	<i>Laboratory technician</i>	75,000.00	2	2,500.00	5,000.00		
11	<i>Safety officer</i>	75,000.00	3	2,500.00	7,500.00		
12	<i>Skilled labor</i>	50,000.00	8	1,666.00	13,328.00		
13	<i>Gate keeper</i>	35,000.00	2	1,166.00	2,332.00		
14	<i>Security Guard</i>	35,000.00	2	1,166.00	2,332.00		
15	<i>Cook</i>	35,000.00	2	1,166.00	2,332.00		
16	<i>Driver</i>	35,000.00	2	1,166.00	2,332.00		
					-	-	
Total					773,986.67	40,000.00	19.35

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Table 2 -

PKR 170/liter of crude oil

Refinery Profit Calculator/Day @PKR 170/liter of crude oil

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Table 3 -

PKR 160/liter of crude oil

Refinery Profit Calculator/Day @PKR 160/liter of crude oil

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Table 4 -

PKR 150/liter of crude oil

Refinery Profit Calculator/Day @PKR 150/liter of crude oil

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