Hydrocarbon ***Blending***, Storage, and Distribution Facility

Marine Terminal - Pacific Coast

hallow energy

In-Line Blending Station. General Approach:

Market assessment

- The optimal commercial operation for the Port's Marine Terminal would be one that combines a storage terminal and a blending facility.
- Despite having a sound demand CAGR, the local market has a high concentration in 3 players. This is an opportunity but also a commercial risk that can be hedged by building a blending facility capable of producing 250,000 barrels of finished products with 2.5 rounds per month.

Operational assumptions

- Assuming the storage facility would have a 500,000 barrels capacity.
  - → 250,000 barrels (nominal) can be sold directly in the local market, with a 2.5 times month factor that would propel sales to 531,250 barrels per month (85% operational).
  - → 250,000 barrels can be reexported to other countries, with a 3 times per month factor that would deliver 637,500 barrels per month (two MR1 or one large tanker).

	Option 1. **Basic Blending System** (storage terminal complexity, two to three streams for blending per month)	**Option 2.** **Complex Blending System** (refinery complexity , two to three streams for blending per month)
Key infrastructure for In-line blending	In addition to the final products storage and dispatch, plus the marine off/on-loading assets. ▪ Tanks for every component with connecting pipes and level and flow measurement systems. ▪ The base gasoline / diesel (fuel oil) will be the one with the larger volume. ▪ Approx. 10% of the total volume for octane/cetane boosters. ▪ One tank for additives with its level and flow measurement system. ▪ On-line analyzers with a sample analyzer flow system. ▪ Control room equipped with pipeline control and management system, software for supervision and validation, and metering control cabinets. ▪ Custody-transfer metering systems ▪ Finished products storage tanks	In addition to the final products storage and dispatch, plus the marine off/on-loading assets. ▪ Tanks for main (6 to 7) with their pipes and their level and flow measurement systems. ▪ One tank for additives with its level and flow measurement system. ▪ On-line analyzers with a sample analyzer flow system. ▪ Pipeline control and management system (control room) ▪ Software for evaluation —supervision and validation— ▪ Metering control cabinets. ▪ Custody transfer metering systems ▪ Prover and master meters ▪ Finished products storage tanks
In-line blending components	▪ Components for blending (illustrative for a complex operation): → Base gasoline (or base diesel component) → Octane boosters (such as ethanol, MTBE, and TAME) → Additives ▪ Each component needs a dedicated tank that will be connected through pipes .	▪ Components for blending (illustrative for a complex operation): → Isomerate → Butane → Reformate → Hydrocracked / FCC gasoline / distillate → Alkylate → Butane → Naphtha ▪ Each component would need dedicated tanks do the gasoline and diesel blending.

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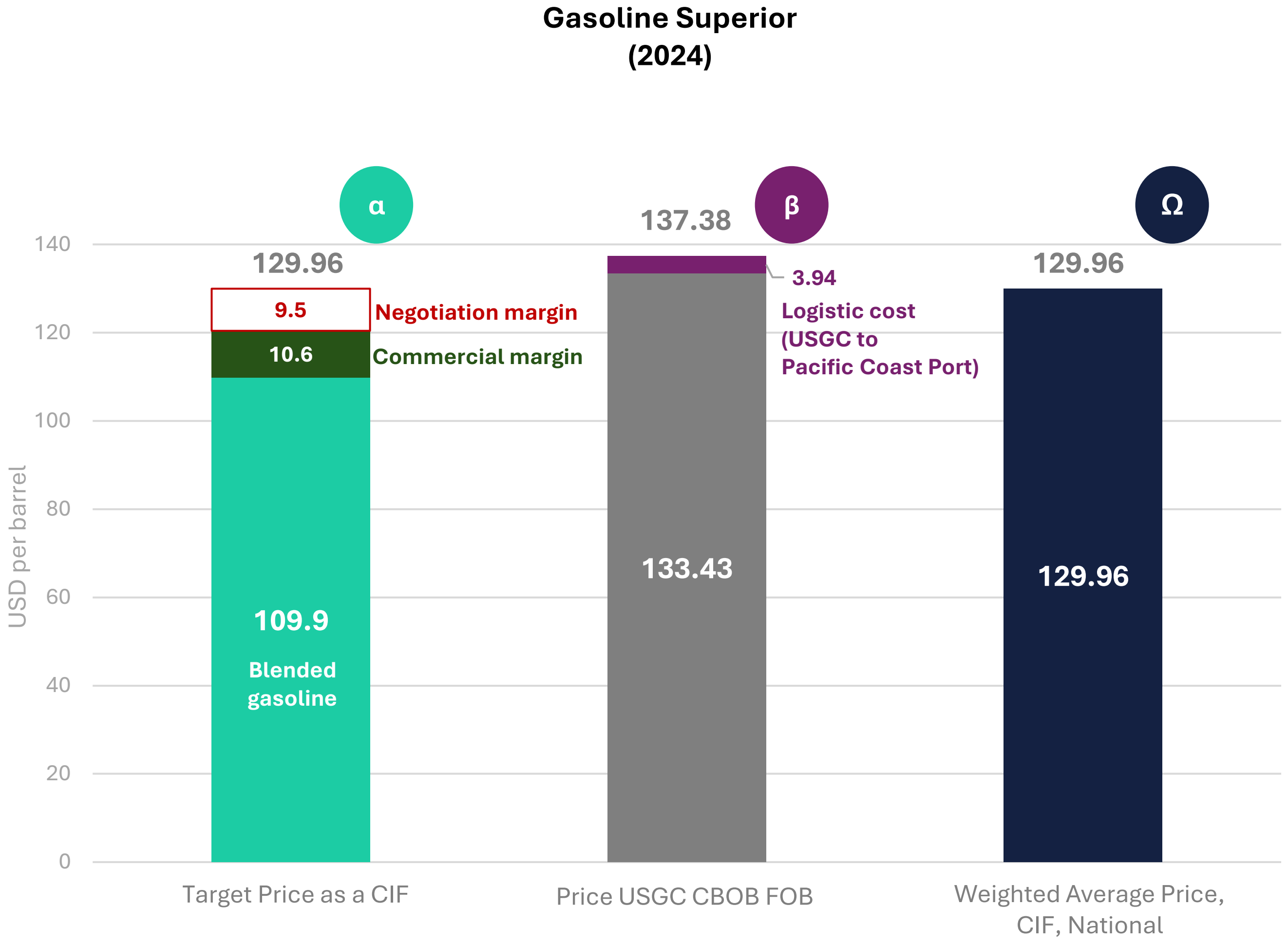
In-Line Blending Station. Incentive for Off-takers: Building a blending facility provides traders with a price advantage over their competitors on the Pacific Coast.



Weighting and estimating the gasoline mix with a linear blending model

- The average weighted gasoline molecule price was 109.9 USD/b, based on a linear model with a 90% gasoline and 10% ethanol mix.
- This mix brings up an octane number and RVP according to the local market regulation.

Gasoline blending components

(illustrative example)

Summer gasoline blend @Regular gasoline

Component	Percent	Octane	RVP	Octane W Avg	RVP W Avg
Reformate @100 RON	11.0%	94.1	3.2	10.35	0.35
FCC Gasoline	35.5%	84.7	1.4	30.06	0.50
Alkylate @C3= @C4=	8.0%	93.8	5.2	7.50	0.412
Butane @C4	10.6%	92.5	52.0	9.805	5.51
Natural Gasoline	23.4%	64.0	11.1	14.98	2.60
Raffinate	1.5%	60.0	6.0	0.9	0.09
Ethanol	10.0%	116.0	5.0	11.6	0.5
Total	**100.0%**			**85.2**	**10.0**

Source: Author, based on multiple public sources.

***Note: Building a linear optimization model for the blending operation goes beyond the scope of this initial infrastructure assessment. We built a linear model to estimate the required quantity of components and prices for the Local Market.

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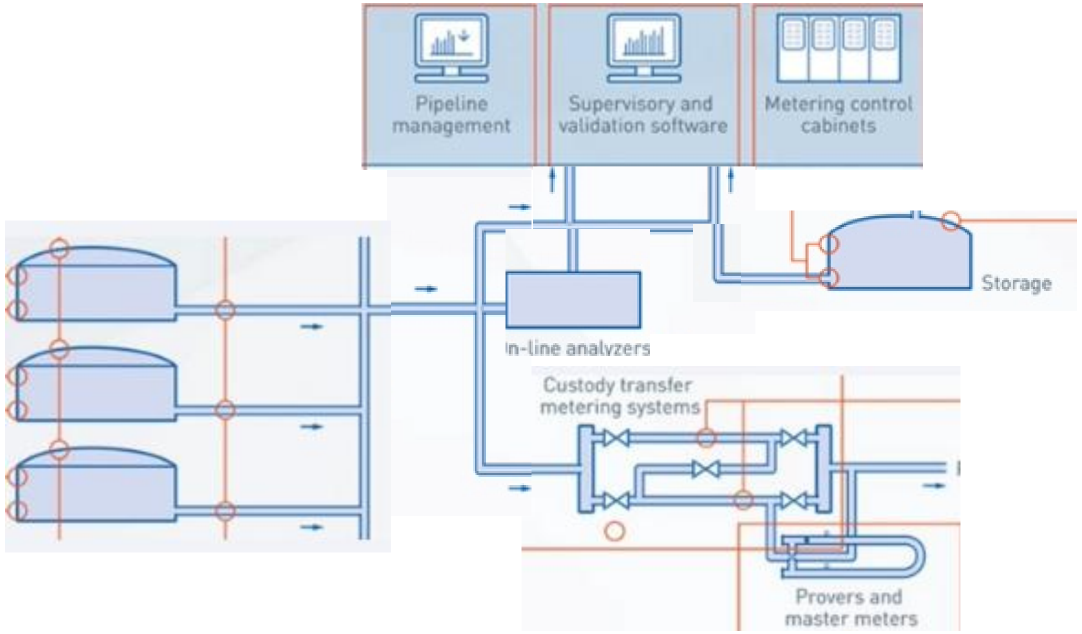
Option 1. **Basic Blending System** (storage terminal complexity, two to three streams for blending)	**Option 2.** **Complex Blending System** (refinery complexity, multiple streams)

Profitability potential above regular tank farms



Profitability potential above regular tank farms