Center for investment services- Golestan Province

Financial-technical Pre-feasibility Study Brief

Plan topic: Urea and Ammonia Production (Petrochemical unit)

ISIC CODE: ISIC 2412612325

ISIC 2412612318

Location: Golestan province

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1-Project introduction

1-1- **project title:** Urea and Ammonia Production (Petrochemical unit)
1-2- projects proposed location: Golestan province
1-2- product & **Annual production capacity:** Urea 1073000 tons Ammonia 680000 tons
1-3- Total required capital funding: (Rials, and Dollars value) 67563170 million Rials (Currency: $ 648362426 / Rial 15694176 million Rials) **- Working Capital:** 936865 million Rials **- Constant capital:** 66660669 million Rials
1-5- Type of the stock material: Natural gas 429 million cubic meters per year
1-6- Domestic access to stock material in percentage: 100%
1-7- Staff requirements: 426 person
1-8- Rate of output at the breakeven point: 10%
1-9- Internal (gross) Rate of Return: 59%
1-10. How to access technical knowledge: Machines required for the manufacturing process are available from China, Japan, South Korea, Germany, Italy and the United States. Most of the supplier companies turn-key production technology. The availability of these machines from domestic manufacturers is not currently available. The cost of technical knowledge is in the equipment section.

2-Tecnichal details

2-1- product introduction

The products that can be sold are urea and ammonia
Urea: Physical state: Solid - Physical shape: Solid white - Water solubility: Soluble - Molecular weight: 60 (g / mol) - Nitrogen: 46.6% - Density: 1/335 (kg / m3) Melting point: 132/7 ° C
Ammonia: Physical state: Gas - Physical shape: Colorless gas with a strong odor - Water solubility: Highly soluble at high temperatures - Molecular weight: 17 (g / mol) - Nitrogen: 82.2% - Boiling point: 33/4 ° C; Freezing Point: 77.7 ° C; Critical Temperature: 133 ° C; Critical Pressure: 112/7 °

Applications of solar cell systems as sources of energy are as follows:

The largest consumer market for urea is chemical fertilizers (solid and liquid). It is also used in batch forms of liquid and solid chemical fertilizers that are coated with sulfur or polymers to produce, or a significant amount of this material is covered by formaldehyde. In addition to the above, urea-based urea, formaldehyde resins, melamine and other urea-based urea-based applications are of considerable use. Ammonia can be used for the preparation of chemical fertilizers, ice cream, nitric acid, other nitrogen compounds, explosives and food storage. Another use of ammonia can be used in weight lifting and powerlifting. Sweating this solution causes the vessels to open and exercise will be somewhat nervous and will help in controlling the weight in the tournament.

2-3- Description of production process:

A. Ammonia unit:

Gas is used as the heat source in the first refiner, and since these compounds in the natural gas feeds cause poisoning for single catalysts, these harmful compounds should be separated from the gas. Therefore, natural gas is preheated at the beginning of the ammonia unit, and the temperature rises to 370 ° C. Then some hydrogen gas is added to a molybdenum cobalt catalyst containing reactor. In this tower, sulfur compounds in natural gas react with hydrogen and produce hydrogen sulfide gas. To isolate hydrogen sulfide, at 370 ° C, two towers containing zinc oxide catalyst are removed from the gas.

After the complete removal of sulfur compounds in natural gas, steam is added to it and sent to a furnace called the original reforestor. In the furnace, a mixture of gas and steam is heated to 800 ° C, in the vicinity of the nickel catalyst, the reforming reaction is performed and the synthesis gas, including carbon monoxide and hydrogen, is produced.

Methane requires a higher temperature to complete the reforwarding reaction, so the existing gas mixture, which contains methane, carbon monoxide and hydrogen, is sent to another reactor, the secondary refiner, which contains the nickel catalyst. The nitrogen needed to produce ammonia, which is compressed from the air by the compressor, is injected into the tower. In this reactor, while completing the methane reforming process at 1200 ° C, the oxygen in the air also burns some hydrogen produced to water.

At the outlet of this reactor, using two reactors containing iron and copper catalyst. , The reactant water converts carbon monoxide into synthesis gas into carbon dioxide.

The resulting gas mixture contains hydrogen, nitrogen and carbon dioxide. To remove carbon dioxide from this mixture, the aMDEA solvent gas was used in the absorption tower. The saturated aMDEA in the absorption tower is restored and reused in the Stripper Tower. Separated carbon dioxide gas is sent to the urea production unit as a sub-product.

In order to remove the low amounts of carbon monoxide and carbon dioxide contained in the gas mixture and convert them back to methane, a gas reactor containing nickel catalyst is used to heat the gas in a heat exchanger up to 300 ° C.

The existing gas mixture, which contains hydrogen and nitrogen, was first cooled and compressed by a two-stage compressor up to 180 times and then exchanged in heat exchangers and immersed in a molecular bed, into an ammonia reactor called Convertor The contents of the 4th iron oxide catalyst bed are sent. At 180 ° C and 450 ° C, ammonia is produced and removed from the converter. The reaction of ammonia production is equilibrium and in one stage 18% of ammonia is produced Therefore, the gas mixture of the converter output is cooled down to -20 ° C using a refrigeration system, which includes a number of heat exchangers and a compressor, to allow the ammonia to be fluidized and to dissipate from the reaction of unreacted gases. Unreacted gases , Is returned to the converter and the ammonia produced, while reducing the temperature to -33° C, is sent to 20,000 tons of ammonia storage.

One part of the ammonia unit is the steam production unit. In the process of producing ammonia, a lot of heat is generated that spends generating 360 tons per hour. The steam is used to process the process in the initial

reformer and also serves as a driving force for turbines for rotary machines, especially compressors.
The other side of the ammonia unit is the close loop cooling system. This water is used as a coolant in different parts of the process and is cooled down by the sea lips.

B. Unit of urea:

The intake of this unit consists of CO2 and ammonia gas, which increases the pressure of CO2 gas by a compressor system up to 150 times and the pressure of ammonia liquid by more than 150 times to pump up to 145-148 times the synthesis. The chemical reaction between ammonia and CO2 produces ammonium carbonate, which is highly thermosensitive and produces energy from steam, which is used as a turbine drive and also as heat exchangers as a heater. Ammonium carbonate solution is sent to an equilibrium reactor, and at each stage, 33% of urea is produced and the reactor output solution is purified by a stripper.
A solution of urea produced at a concentration of 75% is fed to a condenser to increase its concentration to 95%, then solidify in the granulation section and send it to the warehouse

3-Economic situation

3-1- Estimated product demand:

The global demand for ammonia and urea in 2020 will be about 200 million tons and 60 million tons, which is expected to increase to 250 million tons and 75 million tons, respectively.

3-2- Export rate in the past 3 years:

The target market for this investment is export, especially for the Chinese and European markets. Products will be shipped to maritime or railways and marine markets to target markets.

Description	unit	2016	2017	2018
Urea	Million tons	3.40	3.55	3.16

3-3- current annual local and domestic production rate:

In the province, which does not have a sample of the production unit, in the country, nowadays, the petrochemical companies of Pardis, Shiraz, Kermanshah, Khorasan are operating with a production capacity of 8.5 million tons per year.

3-4- Import rate in the past 3 years:

In 2017
Urea 5000 tons/years
In 2016
Urea 7000 tons/years
In 2015
Urea 9000 tons/years

4-Financial studies

4-1- Capital Expenditures (*capital outlays*):

Constant capital:

description	Value in million Rials	Value in Dollar	Total sum
Land acquisition	275000	---	275000
Buildings construction and improvements on the land	626162	---	626162
facilities	400000	334288200	427143056
Machinery and equipment	6952179	314074226	37292906
Vehicles	29000	---	29000
Lab, office, and safety equipment	22000	---	22000
10% - Unexpected costs	6017336	---	6017336
Pre implementation cost	470000	---	470000
Total fixed capital	14791677	648362426	66660669
Total sum			66660669

Exchange rate parity is considered 80000 rials according to Iran Central Bank (Bank Markazi) official report.

Working Capital

description	Value in million Rials	Value in Dollar	Total sum
Stock material (1 months)	477746	---	477746
salaries and wages (1 months)	22773	---	22773
Other (2 months)	436345	---	436345
sum	936865	---	936865
Total sum in million Rials			936865

4-2- Land acquisition:

description	Area (sq m2)	Unit Value in million Rials	Total sum in million Rials

Land	550000	500000	275000

4-3- Buildings construction and improvements on the land:

description	Area (sq m2)	Unit Value in million Rials	Total sum in million Rials
Production salon and lab ,…	13033	10000000	116210
Office , services building	1322	12000000	15864
stores	26250	9000000	236250
Improvement on the land	510717	500000	255358
Fencing	3100(m)	800000	2480
Sum			626162

4-4- Facilities:

description	Technical details	Unit Value in million Dollar	Unit Value in million Rials	Total sum in million Rials
Power supply systems	CHP 25 MW	285000000	---	22800000
Water supply systems	1	---	30000	30000
Gas Piping	1	---	100000	100000
Utility unit, vessels,..	1	49288200	---	3943056
sum		334288200	400000	27143056

4-5- Machinery and equipments:

description	quantity	Unit value in	Total value in	Unit Value	Total	Total sum in

		Dollar	Dollar	in million Rials	value in million Rials	million Rials
Pressure equipment and Vessels	1	5992642	5992642	---	---	96000000
Reformer unit	1	22750000	22750000	---	---	9600000
Process vapor production equipment	1	2340000	2340000	---	---	
Hydrogen production equipment and injection into process system	1	10668840	10668840	---	---	
Ammonia Storage Tanks	1	13520715	13520715	---	---	
Unit heat exchangers	1	9881189	9881189	---	---	
High pressure steam generating equipment	1	10158817	10158817	---	---	
Electrical equipment and cables	1	12489506	12489506	---	---	
Trays and equipment inside process towers	1	1430312	1430312	---	---	
Fire detection and fire detection system	1	5460086	5460086	---	---	
Ammonia Process Package	1	18720760	18720760	---	---	52000
Ammonia unit and urea core and submersible compressors	1	70200000	70200000	---	---	19000
Transmission system and product packaging	1	14950000	14950000	---	---	7600

Process unit pumps	1	12480000	12480000	---	---	998400
Blowers and fans	1	6240000	6240000	---	---	499200
Installation	1	---	---	6952179	6952179	6952179
Instrumentation, quality control and electrical items	1	23146370	23146370	---	---	1851710
PIPING VALVES AND STEEL STRUCTURES	1	25740493	25740493	---	---	2059239
Basic knowledge and design	1	20460050	20460050	---	---	1636804
Others	1	27444445	27444445	---	---	2195556
sum			314074226			37292906

4-6- Vehicles:

description	quantity	Unit Value in million Rials	Total sum in million Rials
Car firefighter	1	4500	4500
Car (Peugeot)	4	700	2800
Pickup truck(Nissan)	2	600	1200
Bus	2	7500	15000
Tanker trailer	1	5500	5500
sum			29000

4-7- Lab, office, and safety equipments:

description	quantity	Unit Value in million Rials	Total sum in million Rials
Lab equipments	1	12000	12000
Office supplier	1	4000	4000
Safety equipments	1	6000	6000
sum			22000

4-8- Pre implementation cost:

description	Total sum in million Rials
Licenses	15000
Feasibility study	1400
Drawings and plans	450000
One person's salary	3600
sum	470000

Product cost calculation:

4-9- Type, quantity, and cost of the stock material and required packaging:

description	unit	Consumption rate	Value in million Rials	Total sum in million Rials
Natural gas	ton	307164	18	5528952
Catalysts	ton	3000	68	204000
sum				5732952

4-10- Human resources:

description	quantity	Monthly wage (rials)	Monthly wage sum in million Rials	Total sum annual salaries in million Rials
Management staff	1	70000000	70	840
Office worker	90	30000000	2700	32400
Manufacturing labor - Expert - Skilled - Unskilled - welfare	 50 120 165	 55000000 45000000 30000000	 2750 5400 4950 6903	 33000 64800 59400 82841
sum	426		22773	273281

4-11- annual fuel and energy consumption:

description	unit	Consumption rate	Unit Value in Rials	Total sum in million Rials
Water	M^3	13860000	1500	20790
Electricity	CHP25 MW	---	---	---
Gas	In raw material	---	---	---
Gas oil	Liter	146000	5000	730
Gasoline	Liter	73000	10000	547.5
Telephone communication	Pals	750000	1500000	150
sum				22217.5

4-12- annual depreciation expenses and repair and maintenance costs:

description	Asset value in million Rials	Deprecation		repair and maintenance	
		Percentage	quantity	Percentage	quantity
Buildings construction and improvements on the land	626162.5	7	43831	3	18785
facilities	27143056	7	1900014	4	1085722
Machinery and equipments ,vehicles ,lab , office	32129117	10	3212911	4	1285165
sum			5156756		2389672

4-13- Annual earnings forecast:

description	Production rate(ton)	Unit sale in Rials	Earning in million Rials	Earning in Euros	Total sum in million Rials
Urea	1073000	27200000	29185600	---	29185600
Ammonia	680000	34800000	23664000	---	23664000
sum					52849600

4-14 -Price calculations:

description	unit	full price calculation in Rials	Sale price in Rials
Urea	ton	4332538	27200000
Ammonia	ton	5543100	34800000

Exports are also available if you wish

5- Project justification:

a) Infrastructure facilities(energy , water , shipping , …)
b) Proximity to the gas pipeline
c) Maritime with other countries
d) Access to power resources
e) Sustainable climate
f) Financial : 1)return on investment 2 years 2) Production breakeven point: 10% 3) rate of return on investment (roi): 59 %

6- Qualifications, benefits, and incentives of implementing the project in the region:

According to the program's objectives, the government has to increase its production of urea and ammonia. The project has now been implemented in the province, and as a half-full-scale plan, it has a 20 percent improvement, which has been stopped by the lack of investment partnerships. And the bases and substructures are ready.

7- Contact information:

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