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CCC BLUE HORIZON

EXAMPLE BUSINESS CASE

XBF FUEL CONVERSION UNIT

REFINERY
UNITED ARAB EMIRATES



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1. CASE DESCRIPTION

This is a Business Case description for the installation and operation of a Xegate XBF Catalyst Unit in:

- **Refinery in the Middle East**

1.1 Location

The location for this Business Case has been identified in:

- **United Arab Emirates**

as they have availability of feedstock, have excellent refining experience and technology, are close to the Production Facilities, have a big hub for Oil Products distribution (Fujairah).

In this location it is fairly common to trade oil commodities at market prices.

1.2 Refinery Description

The Refinery chosen for this Business Case is:

- **UAE Refinery**

The Refinery specifications are:

- Location: **West of Abu Dhabi, UAE**
- Production: **100,000 MT/day**
- Products:
 - **LPG** **560,000 MT/year**
 - **Naphtha** **5,500,000 MT/year**
 - **Gasoline** **2,600,000 MT/year**
 - **Jet Fuel** **5,600,000 MT/year**
 - **Diesel** **5,500,000 MT/year**
 - **Fuel Oil & Residue** **1,100,000 MT/year**

Ruwais refinery is a high-efficiency structure, having only about 5% of products in the range of Fuel Oil & Residue.

1.3 Scenario

In this a Business Case Scenario (example), we are going to install a Xegate XBF Catalyst Unit in Ruwais

Refinery in order to process its Fuel Oil & residue.

We are going to design the XBF Unit for:

- **XBF Unit Production** **1,000 MT/day**

The Feedstock shall be:

- **Fuel Oil & Residue** **50%**
- **Water** **50%**
- **Catalyst** **< 1%**

The Products shall be:

- **Emulsion Fuel Oil** **100%**

1.4 Technology Description

XBF Catalyst is non-metal product capable of processing Hydrocarbon with Water to produce Emulsion Fuel.

XBF can be also used to cleaning Oil Sludge and polluted lakes.

About this Catalyst, Hydrocarbon (Waste Hydrocarbon, Mazut, Oily Sludge, ...) is mixed with water (even waste water), creating a stable Fuel (Low NOx, Low Sulphur and Smokeless) emulsion with water to be mainly used for Ships and Power Plants.

It can be used, as an example, to clean the Refinery Oil Sludge (Refinery Waste), to produce income for the Refineries, in Tank Cleaning activities, in Hydrocarbon-Polluted Lake Cleaning activities.

Name:	XBF
Effect:	Clean Waste Oily Sludge and Lakes
Field:	Oil & Gas
Category:	Catalyst
Operative Temperature:	85°C (about)
Operative pressure:	Atmospheric

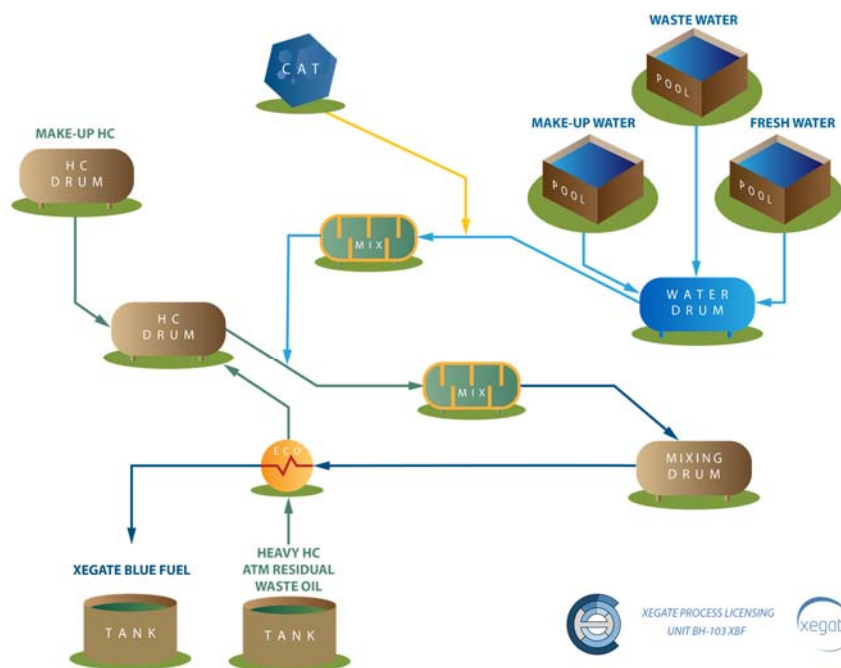


Fig. 1.1: Process Flow Diagram XBF

The Process Unit subject of this case is composed of the following equipment:

ID	Equipment	Tag N.	Q.ty
A 1	HSFO Drum	107-D-101	1
A 2	HSFO Heater	107-HE-101	1
A 3	HSFO Pump	107-P-101 A	1
A 4	HSFO Pump	107-P-101 B	1
A 5	SCCI Package	107-U-101	1
A 6	SCC Mixer	107-M-101	1
A 7	Hybrid Mixer	107-MH-101	1
A 8	Mixing Drum	107-D-102	1
A 9	Mixing Heater	107-HE-102	1
A 10	Mixing Agitator	107-AG-101	1
A 11	Mixing Pump	107-P-102 A	1
A 12	Mixing Pump	107-P-102 B	1
A 13	Mixing Cooler	107-A-101 A	1
A 14	LCO Drum	107-D-103	1
A 15	LCO Pump	107-P-103 A	1
A 16	LCO Pump	107-P-103 B	1
A 17	Process Automation	-	1

Tab.1.1: XBF Process Unit

1.5 Technology Readiness Level

Technology Readiness Levels (TRL) are a type of measurement system used to assess the maturity level of a particular technology.

For an overview of the TRL, please refer to [Attachment 1](#).

About the TRL of XBF Catalyst:

Product Name	Catalyst Description	TRL (API 17 N)
XBF	About this Catalyst, Hydrocarbon (Waste Hydrocarbon, Mazut, Oily Sludge, ...) is mixed with water (even waste water), creating a stable Fuel (Low NOx, Low Sulphur and Smokeless) emulsion with water to be mainly used for Ships and Power Plants. It can be used, as an example, to clean the Refinery Oil Sludge (Refinery Waste), to produce income for the Refineries, in Tank Cleaning activities, in Hydrocarbon-Polluted Lake Cleaning activities.	7 (API 17 N)

Tab.1.2: Catalyst TRL

1.6 Catalyst Production Capacity

Our Catalysts are produced in Iran by KGM.

Here below the production in numbers:

NANO-CRACKING Catalyst (Industrial Plants, TRL 7):

Catalysts produced to date:	20,000 kg
Hydrocarbon treated to date:	200,000 Metric
Buyers:	Iran, Russia

MASS-MAX & XBF Catalyst (Industrial Plants, TRL 7):

Catalysts produced to date:	170,000 kg
Hydrocarbon treated to date:	570,000 Metric Tons
Buyers:	Iran, Russia

OCTAN-BOOSTER Catalyst (Industrial Plants, TRL 7):

Catalysts produced to date:	1,000,000 kg
Hydrocarbon treated to date:	6,700 Metric Tons
Buyers:	Iraq, Afghanistan



NEO-SRU-F Catalyst (Industrial Plants, TRL 7):

Catalysts produced to date:	720,000 kg
Hydrocarbon treated to date:	180,000 Metric Tons
Buyers:	Iran

Total Capacity:

Total Catalysts produced to date:	1,910,000 kg
Total Hydrocarbon treated to date:	956,700 Metric Tons
Total Catalyst Production Capacity:	10,000 kg to 20,000 kg per day

1.7 Previous Achievements

For Previous Achievement on this technology, please refer to [Attachment 2](#).

2. ASSUMPTIONS

This chapter includes all the assumption used for the Financial Analysis.

License and Land

We have not considered any cost for land, license and certifications, since we are located in a large existing Refinery.

The required land extension for the Unit is:

- **Land Extension** **625 m²**

Production Rate

The standard production rate of this Unit has been considered:

- **Unit Production Rate** **1,000 MT/day**

Unit Construction Investment

The total investment of the Unit includes:

- **Engineering License**
- **Engineering**
- **Process Unit**
- **Pilot Unit**
- **Shipment**

- **Installation, Commissioning & Start-Up Activities**

Note that, it has not been included any Logistics Unit, Utility Unit, Auxiliary Facilities, Off-Site Facilities since the Process Unit is going to be installed in a large existing Refinery.

Note that a Mobile Pilot Unit has been included in the costs, simulating the case when the Client asked for testing and validation before the installation of the real Unit. For more info about Qualification & Testing, please refer to [Attachment 3](#).

The cost of Unit Construction & Start-Up Investment cost is therefore:

- **Unit Investment** **4,515,124 USD**

Construction Activity Plan

The following Engineering, Procurement, Construction Plan has been considered:

ACTIVITY	MONTHS											
	1	2	3	4	5	6	7	8	9	10	11	12
Engineering	■	■										
Procurement		■	■	■	■							
Shipment			■	■	■	■						
Construction & Installation			■	■	■	■	■					
Commissioning					■	■	■					
Start-Up						■	■	■				
Production								■	■	■	■	■

Tab.2.1: Activity Plan

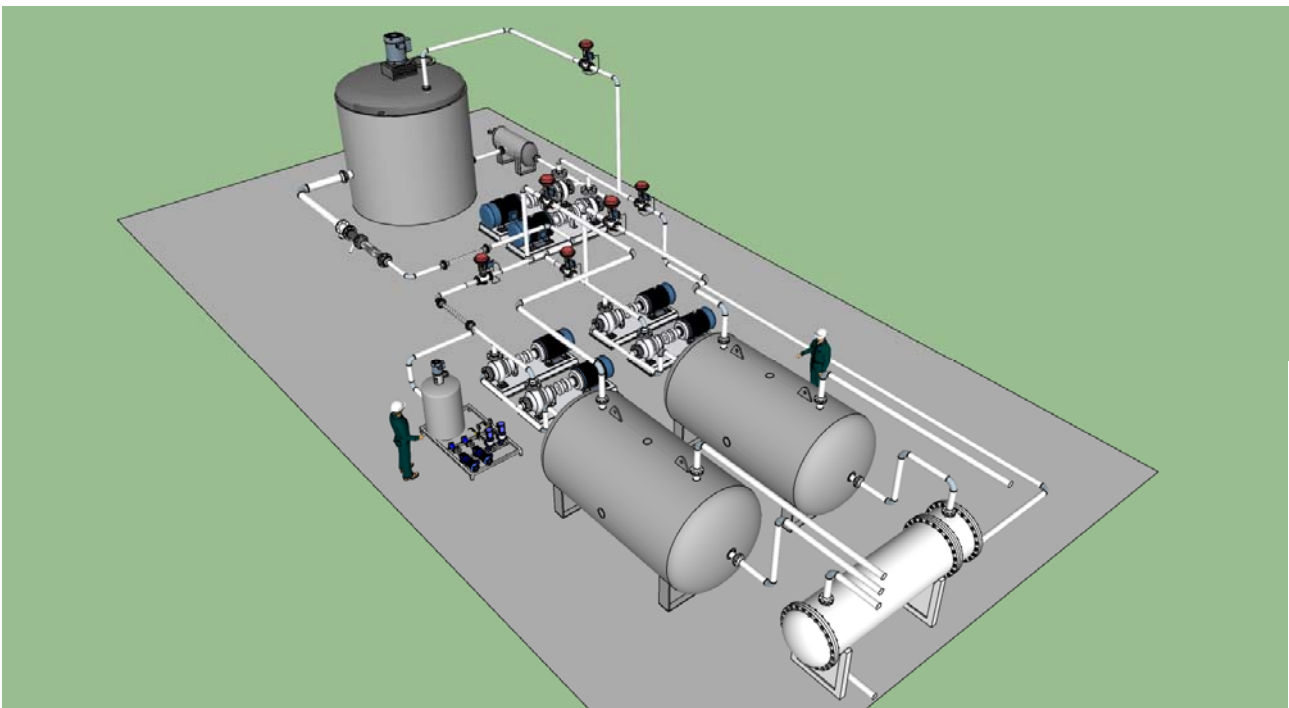


Fig.2.1: XBF Unit, rendering

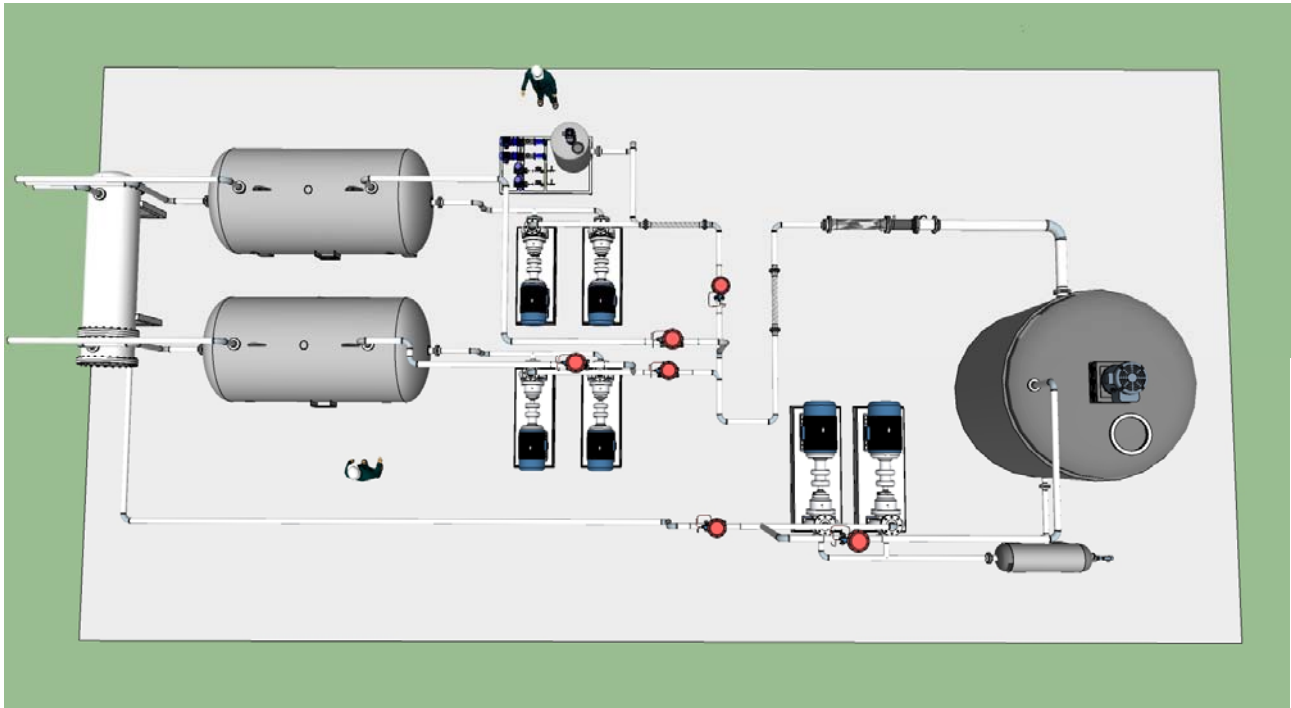


Fig.2.2: XBF Unit, rendering

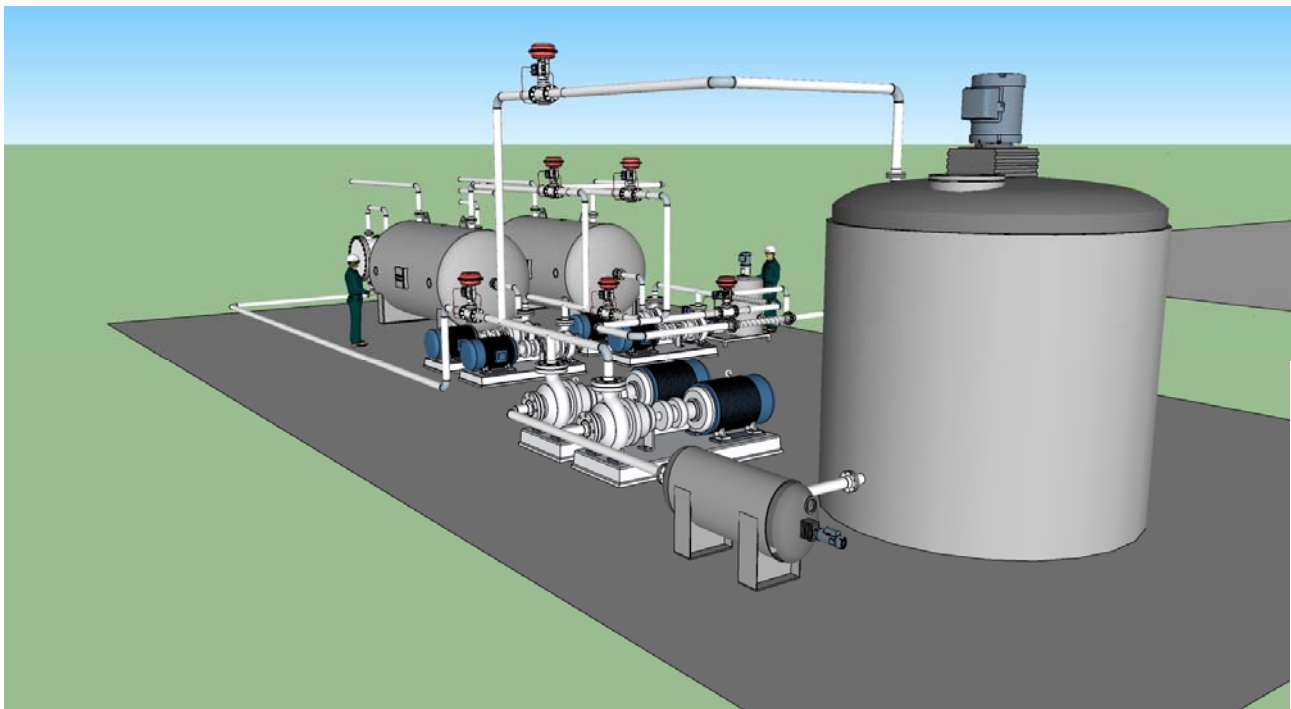


Fig.2.2: XBF Unit, rendering

Feedstocks, Products & Utilities

The calculated quantities of Feedstocks, Products, Utilities are:

PROCESS

Process Stream	Unit	Q.ty
HSFO (Feed)	[MT/h]	20.83
Water (Feed)	[MT/h]	20.83
Catalyst (Feed)	[MT/h]	0.06
Emulsion HSFO (Product)	[MT/h]	40.83

UTILITIES

Utility Stream	Unit	Q.ty
Utility Water	[MT/year]	756
Fuel Gas - Methane	[MT/year]	483
Electric Power	[MWh/year]	981
Steam	[MT/year]	32,495

Tabb.2.2: Streams

The price of Feedstocks, Products, Utilities have been considered in the Financial Analysis as follows:

PROCESS

Process Stream	Unit	Market Price
HSFO (Feed)	[USD/MT]	250.00
Water (Feed)	[USD/MT]	3.00
XBF Catalyst (Feed)	[USD/kg]	45.30
Emulsion HSFO (Product)	[USD/MMBTU]	225.00

UTILITIES

Utility Stream	Unit	Market Price
Water	[USD/m3]	3.00
Fuel Gas - Methane	[USD/MMBTU]	1.80
Electric Power	[USD/kW]	0.08

Tabb.2.3: Costs

The price of **Fuel Oil** has been considered the **as the price of HSFO at the time of the calculation with a discount of -7 USD/MT.**

The price of **XBF Emulsion HSFO** has been considered the **as 90% of the price of HSFO at the time of the calculation with a discount of -7 USD/MT.**

Personnel

The personnel employed for the Unit has been considered **N.9 people**:

Personnel	Q.ty
PROCESS ENGINEER	1
STATIC MANPOWER	3
ROTATIVE MANPOWER	2
ELECTRICAL MANPOWER	2
LOGISTIC MANPOWER	2

Tab.2.4: Personnel

The cost of personnel is therefore:

- **Cost of Personnel** **272,970 USD/year**

Data

The following data have been considered for the analysis:

Utility Stream	Unit	Current Market Price
Work days/year	[days]	350
Material Losses	%	2%
Maintenance	%	5%
Life Span	[years]	15
Taxes	%	15%
Discount Rate (annual)	%	10%
Interest Rate (annual)	%	10%

Tab.2.5: Data

3. FINANCIAL ANALYSIS

This chapter analyses the costs and benefits of the Business Case.

It is split into:

- **Investments and Costs**
 - **Unit Construction Investment**
 - **Operation Costs**
- **Revenues & Profits**
 - **Sales Revenues**
 - **Profits**



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INVESTMENTS & COSTS

UNIT CONSTRUCTION INVESTMENT		
LAND	0	USD
EXTENSION :	625	m2
LEGAL PERMITS	0	USD
ENGINEERING LICENSE	291,755	USD
ENGINEERING	384,563	USD
PROCESS UNITS	2,443,750	USD
LOGISTICS SYSTEMS	0	USD
UTILITY UNITS	0	USD
AUXILIARY FACILITIES	0	USD
OFF-SITE FACILITIES	0	USD
PILOT UNIT	120,000	USD
EQPMT SHIPMENT	179,463	USD
INST, COMM, STARTUP	512,750	USD
UNIT INVESTMENT	3,932,280	USD

Tab.3.1: Unit Construction Investment



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OPERATION COSTS			
FEEDSTOCK		44,275,000	USD/year
QUANTITY :		350,000	MT/year
AVERAGE PRICE :		127	USD/MT
CATALYST		23,782,500	USD/year
QUANTITY :		525	MT/year
AVERAGE PRICE :		45,300	USD/MT
ELECTRICITY		78,476	USD/year
AVERAGE CONS. :		2.9	kWh/MT
PRICE :		0.08	USD/kWh
FUEL GAS		45,675	USD/year
QUANTITY :		483	MT/year
PRICE :		0.006	USD/kWh
STEAM		97,484	USD/year
PERSONNEL		272,970	USD/year
MAINT & SERVICES		122,188	USD/year
OPERATION COSTS		68,674,293	USD/year

Tab.3.2: Operation Costs



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REVENUES & PROFITS

SALES REVENUES

PRODUCT	77,175,000	USD/year
QUANTITY :	343,000	MT/year
AVERAGE PRICE :	225	USD/MT
TOTAL SALES REVENUES	77,175,000	USD/year

Tab.3.3: Sales Revenues

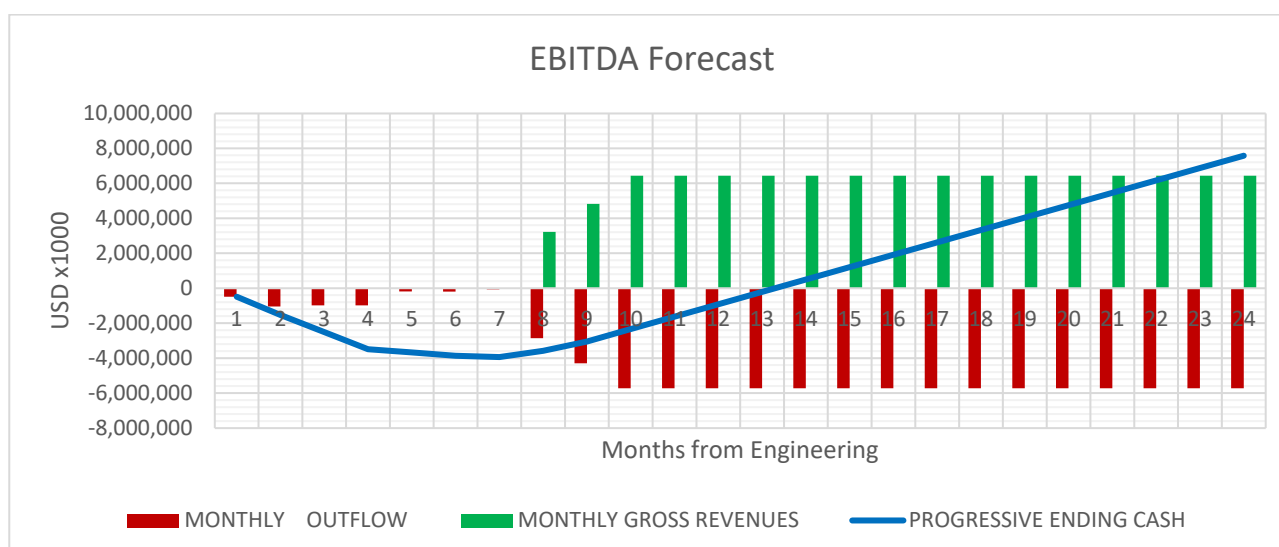
PROFITS

1. EBITDA	8,500,707	USD/year
2. DEPRECIATION	147,917	USD/year
3. EBIT	8,352,790	USD/year
4. PROFIT B4 INC TAX	7,959,562	USD/year
5. INCOME TAXES	1,193,934	USD/year
6. NET PROFIT	6,765,628	USD/year
7. PAYBACK B4 INC TAX	0.47	years

Tab.3.4: Profits

CASH FLOW									
YEAR	MONTH	MONTHLY OUTFLOW	PROGRESSIVE OUTFLOW	MONTHLY GROSS REVENUES	PROGRESSIVE GROSS REVENUES	MONTHLY ENDING CASH	PROGRESSIVE ENDING CASH	MONTH	YEAR
1	1	-484,036	-484,036	0	0	-484,036	-484,036	1	1
	2	-1,046,865	-1,530,901	0	0	-1,046,865	-1,530,901	2	
	3	-978,498	-2,509,399	0	0	-978,498	-2,509,399	3	
	4	-978,498	-3,487,896	0	0	-978,498	-3,487,896	4	
	5	-188,008	-3,675,905	0	0	-188,008	-3,675,905	5	
	6	-192,281	-3,868,186	0	0	-192,281	-3,868,186	6	
	7	-64,094	-3,932,280	0	0	-64,094	-3,932,280	7	
	8	-2,861,429	-6,793,709	3,215,625	3,215,625	354,196	-3,578,084	8	
	9	-4,292,143	-11,085,852	4,823,438	8,039,063	531,294	-3,046,789	9	
	10	-5,722,858	-16,808,710	6,431,250	14,470,313	708,392	-2,338,397	10	
	11	-5,722,858	-22,531,568	6,431,250	20,901,563	708,392	-1,630,005	11	
	12	-5,722,858	-28,254,425	6,431,250	27,332,813	708,392	-921,613	12	
2	1	-5,722,858	-33,977,283	6,431,250	33,764,063	708,392	-213,221	1	2
	2	-5,722,858	-39,700,141	6,431,250	40,195,313	708,392	495,172	2	
	3	-5,722,858	-45,422,999	6,431,250	46,626,563	708,392	1,203,564	3	
	4	-5,722,858	-51,145,856	6,431,250	53,057,813	708,392	1,911,956	4	
	5	-5,722,858	-56,868,714	6,431,250	59,489,063	708,392	2,620,348	5	
	6	-5,722,858	-62,591,572	6,431,250	65,920,313	708,392	3,328,741	6	
	7	-5,722,858	-68,314,430	6,431,250	72,351,563	708,392	4,037,133	7	
	8	-5,722,858	-74,037,287	6,431,250	78,782,813	708,392	4,745,525	8	
	9	-5,722,858	-79,760,145	6,431,250	85,214,063	708,392	5,453,917	9	
	10	-5,722,858	-85,483,003	6,431,250	91,645,313	708,392	6,162,309	10	
	11	-5,722,858	-91,205,861	6,431,250	98,076,563	708,392	6,870,702	11	
	12	-5,722,858	-96,928,719	6,431,250	104,507,813	708,392	7,579,094	12	

Tab.3.5: Cash Flow



Graph.3.1: Cash Flow



4. CONCLUSIONS

The XBF Unit of this Business Case resulted to be highly profitable and can be paid back in about 14 months (including the time necessary for Production Plant Installation).

Key parameters are:

- Capital Needs **Euro 11,100,000** (*installation + first 2 month*)
- Pay Back Period **< 14 months**
- Circulating Capital **Euro 11,500,000** (*two months of operation*)

Break Even data are:

- Gross Revenues **Euro 77,175,000**
- Total Variable Expenses **Euro 68,674,293**
- Gross Income **Euro 8,500,707**
- Gross Income Margin **11.01%**