

# The Feasibility Study on The Food Factories of Egypt-Economic analysis.

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## 이집트 식품공장 건설 타당성조사-경제성 분석

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### 요약

본 논문은 이집트의 3대 도시인 포트사이드시에 조성된 공업단지 부지에 분말두유, 쌀전분 및 과일 분말 주스 등을 가공하기 위한 공장 설립에 관한 경제성을 분석한 연구에 관한 것으로, 이집트의 기상환경, 국민들의 습관 등에 비추어 타당한 것으로 판명되었다. 그 중 경제성 분석을 한 것의 결과를 제시한다.

### 1. General

In economical analysis of present project, IRR (Internal rate of Return), PBP (Payback Period) and NPV (Net Present Value) were introduced. Sensitivity analysis is performed by setting all variables at their nominal value and varying each at its upper and lower bound values such as total investment cost, sales price (steam & power) and fuel cost to investigate the impact on internal rate of return.

#### (1) Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) is defined as discount rate equaling the amount summing in current price of all earnings and all amount converted into present price among expenditure during endurance years of plant

In other words, it is the discount rate equaling zero in the difference between income and expenditure converted into the present price during endurance years.

$$\sum_{t=1}^n \frac{I_t}{(1+r)^t} = \sum_{t=1}^n \frac{Q_t}{(1+r)^t}$$

Where,

$I_t$ : Expected amount earning in the year

$Q_t$ : Expected expenditure in the year

$n$ : Period

$r$ : Internal Rate of Return (EIRR or FIRR)

The IRR can be calculated by numerical analysis method using a computer.

The internal rate of return is divided into Financial Internal Rate of Return(FIRR) and Economic Internal Rate of Return(EIRR). And that is a corporate view and this is a national view.

#### ① Financial Internal Rate of Return (FIRR)

The annual net revenue is calculated by subtracting costs such as fuel, O & M, sales and administration,



[Fig. 1] Site Map

### 2. Methodology of economic analysis

insurance, property tax, income tax, and investments from annual gross revenue. The annual gross revenue is calculated from net energy sales (MWh) and selling price.

② Economic Internal Rate of Return (EIRR)

The EIRR calculation is very similar to the calculation of the FIRR. The only difference between EIRR and FIRR is the exclusion of insurance, property tax and income tax, which are imposed by government economic policy. Therefore, the EIRR is always higher than the FIRR.

(2) Payback Period (PBP)

The payback, also called pay-off period, is defined as the period required to recover the original investment outlay through the accumulated net cash flows earned by the project. When making decision of investment, the investment is evaluated as there exists the worth of investment within the investment if the period to collect the investment calculated by the flowing of the cash invested is shorter than the period to collect set.

(3) NPV (Net Present Value)

As it is the method to decide an investment by obtaining the NPV (Net Present Value) calculated by discounting all cash flow with the expense for capital, the Net Present Value is the present value of cash inflow minus outflow of cash.

$$NPV = \sum_{t=1}^n \frac{NCF_t}{(1+K)^t}$$

Where NPV: Net present value of Net cash flow

NCF<sub>t</sub>: Net Cash Flow

K: Expense for capital (%)

n: Business term

t: Frequency

If the NPV is greater than 0 (zero), the income rate is higher than the income demanded and the project can be judged as feasible.

(4) Sensitivity analysis

Sensitivity analysis is to compute the impact into the IRR by varying the upper limit value and lower limit

value of each parameter (Amount invested, waste fee, heat sale's price) after set the proper values of major parameters. Sensitivity analysis is designed to provide a decision-maker with an answer to question about variables.

3. Criteria for economic analysis

1) Basic criteria

- (1) Basic date : July 1, 2009
- (2) Life of power plant: 15 years
- (3) Capacity of facility: Rice starch 50ton/day,  
Soy milk powder 24 ton/day  
Tomoto powder 2 ton/day  
Mango Powder 2.7 ton/day
- (4) Production efficiency : 90%
- (5) Depreciation: Fixed rate method (15year, 3% amount of survival value)
- (6) Income tax rate : 25 % (Apply with 15% over first five years)

2) Construction Cost & period

- (1) Site grading: Jan.1, 2010
- (2) Commercial operation: Jan 1 , 2012
- (3) Investment cost

unit : 1,000usd

Item	1'st year	2'nd year	Sum
Civil/Architecture	10,000	15,000	25,000
Mechanical	26,000	39,000	65,000
Electric	8,000	12,000	20,000
Design	1,000	1,500	2,500
C M	1,200	1,800	3,000
Test run	800	1,200	2,000
Indirect cost	3,400	5,100	8,500
total	50,400	75,600	126,000
I.D.C	2,680	4,020	6,700
Total investment	53,080	79,620	132,700

3) Financing

The financing method of an investment cost is divided into equity financing and long term debt financing from financial institution.

Equity financing can be taken as two forms such as use of retained earnings and issuance of stock. Normally Debt financing includes both long term

loan from foreign, local commercial bank and the sale of long term bonds where money is borrowed from investors for fixed period.

In analysis of economical analysis, it was assumed that 75% of whole investment is secured with the borrowed capital.

The loaning condition of borrowed capital during operation period was estimated with interest rate 5.3% in annual, repaying in ten years with KRW(Korean Won) or USD.

4) Annual operational and maintenance cost

Item	Cost	Remarks	
Materials	Rice	23,990 kUSD	800 ₩/kg(egypt)
	Soy Bean	79,200 kUSD	4,400 ₩/kg(egypt)
	Tomato etc.	1,728 kUSD	2,400 ₩/kg(egypt)
	Mango etc.	1,944 kUSD	2,000 ₩/kg(egypt)
Labor Cost	525 kUSD	Annual Salary 15 kUSD	
Ordinary Expenditure	105 kUSD	20% of Labor Cost	
Insurances	630 kUSD	0.5% of Construction Fee	
Maintenance	756 kUSD	0.6% of Construction Fee	
Electricity	2,718 kUSD	Include basic fee 4,140 ₩/kW h	
Fuel	648 kUSD	Lamp Oil 300 ₩/L(egypt)	
Water	108 kUSD	Water Supply 400 ₩/inf	
Depreciation	6,700 kUSD	20% after 15 years	
Total	119,052 kUSD		

3. Income from the sales of product is total 161,208 kUSD

- (1) Rice Starch :  $50t/d \times 2,500\text{₩}/kg \times 360d = 45,000$  kUSD (Applied 90% )
- (2) Soy Milk Powder :  $24t/d \times 8,700\text{₩}/kg \times 360d = 75,168$  kUSD (Applied 90% )
- (3) Tomato Powder etc. :  $2t/d \times 30,000\text{₩}/kg \times 360d = 21,600$  kUSD (Applied 90% )
- (4) Mango Powder etc :  $2.7t/d \times 20,000\text{₩}/kg \times 360d = 19,440$  kUSD (Applied 90% )

4. Result of Economic Analysis

1) Economic analysis

The method of cash flow was used for the analysis of economic efficiency. In other words, earnings by sale of electricity and steam, amount invested, operational expense, repair & maintenance expenses were computed by converting into current price.

As the index of analysis of economical efficiency, PBP (Pay Back Period), NPV (Net Present Value) and IRR (Internal Rate of Return) were analyzed to decide the economical feasibility. Annual selling of electric power was computed by balancing the electricity power used within power plant from total power produced.

The results analyzed of economical efficient are as follows.

- (1) NPV: 89,521,000USD
- (2) FIRR: 17.65%

Accordingly, the present project is judged to be feasible.

[Table 1] Result of economic analysis

(Unit: 1,000 USD)

Items	Index	Remarks	
Amount of production	Rice Starch	50ton/day	
	Soy Milk Powder	24ton/day	
	Tomato Powder	2 ton/day	
	Mango Powder	2.7 ton/day	
Annual income from the sale	Rice Starch	40,500	Unit price : 0.08USD/kWh
	Soy Milk Powder	67,651	Unit price : 10USD/tCO <sub>2</sub> e
	Tomato Powder	19,440	
	Mango Powder	17,496	
	Subtotal	145,078	
Investment cost	132,700		
Number of Operator (persons)	35		
Operation cost(USD/year)	112,352		
Result of economic analysis	PBP(year)	4.8	
	NPV(kUSD)	89,521	
	IRR(%)	17.65	

2) Sensitivity analysis

Sensitivity analysis was carried out to test the effect on IRR, NPV and PBP through variation of input variables such as investment cost, electric sales revenues, fuel cost used to estimate cash flow.

(1) Sensitivity analysis for variations of investment cost

(Unit: 1,000USD)

Variation rate	IRR(%)	NPV	PBP(year)
120%	16.06%	80,242	5.1
110%	16.82%	84,882	5.0
100%	17.65%	89,521	4.8
90%	18.54%	94,161	4.6
80%	19.51%	98,800	4.4

(2) Sensitivity analysis for variations of product price

(Unit : 1,000 USD)

Variation rate	IRR(%)	NPV	PBP(year)
120%	32.47%	262,003	2.7
110%	25.42%	175,762	3.4
100%	17.65%	89,521	4.8
90%	8.40%	3,280	8.0
80%		-97,337	

(3) Sensitivity analysis for variation of material cost

(Unit: 1,000 USD)

Variation rate	IRR(%)	NPV	PBP(year)
120%	1.55%	-46,669	13.1
110%	10.70%	22,738	6.9
100%	17.65%	89,521	4.8
90%	23.75%	156,304	3.7
80%	29.36%	223,087	3.0

### 5. Conclusion

When Productprice vary up to 80~120%, the variation of earning rates is the most sensitive as 0 ~32.47 %.

When Material costs vary up to 80~120%, the earning rate fluctuates comparatively largely as 1.55 29.36 %.

When the purchase expense of total investment cost varies up to 80~120%, the variation of earning rate is 16.06 19.51%.

Accordingly, product price &material costs are

impacting onthe business feasibility of this project most significantly.

So, when sales of product are confirmed and material are supplied by stable price, this project is judged feasible to push ahead with.

### 참고문헌

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