

# CH0401 Process Engineering Economics

## Lecture 5b

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# Process Engineering Economics

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- 1 Economic Analysis of a complete process
- 2 Operating Plants and Proposed Plants  
(Data Sheet)



# Process Engineering Economics

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- 1 Economic Analysis of a complete process
- 2 **Operating Plants and Proposed Plants  
(Data Sheet)**



# Process Engineering Economics – *Economic Analysis*

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Summary table for analysis of going and proposed plants

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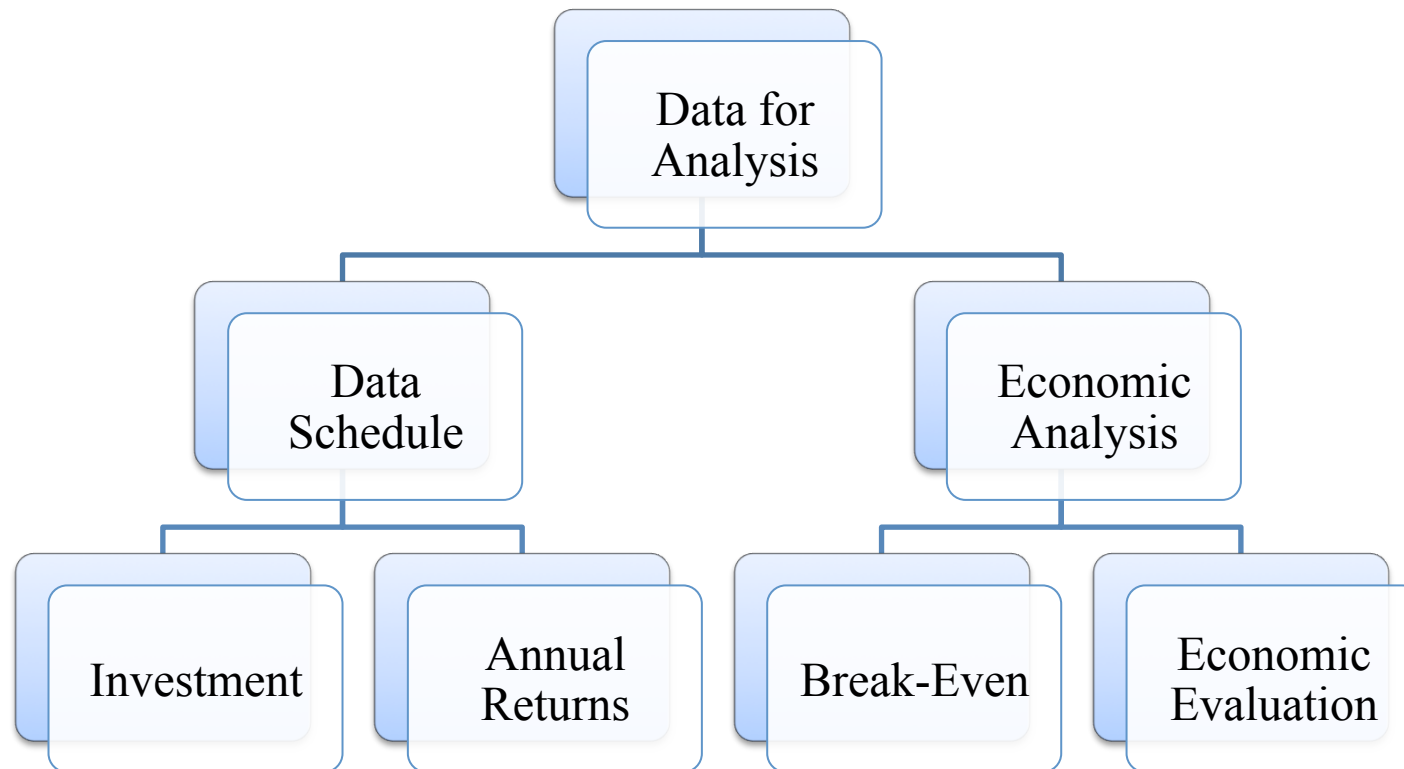
The data sheet or a template used for the economic analysis of an ongoing or a new proposed plant comprises of two major components they are

- ① Data Schedule and
- ② Economic Evaluation

Furthermore the other information pertained to the data schedule and Economic evaluation are grouped as follows

# Process Engineering Economics – *Economic Analysis*

Summary table for analysis of going and proposed plants



# Process Engineering Economics – *Economic Analysis*

Summary table for analysis of going and proposed plants

<b>A. Data Schedule</b>	
1	Investment
a.	Preliminary Expenses
b.	Process Investment
c.	Service Facilities
d.	Land and Buildings
e.	Engineering Design
f.	Construction
g.	Preoperational Charges
h.	Contingency Charge-might be included in previous items
i.	Working capital, inventory and others
j.	Others, Contractors Fee etc.
	Total

Gives us the major manufacturing and non manufacturing costs involved in the going and proposed plant

# Process Engineering Economics – *Economic Analysis*

Summary table for analysis of going and proposed plants

2 Annual returns at the capacity of		75%	100%
a.	Estimated sales at \$ _____ per _____ Qty.	_____	_____
b.	Cost of Sales	_____	_____
	(1) Variable	_____	_____
	(2) Fixed	_____	_____
c.	Gross Profits	_____	_____
d.	Profit tax at _____ %	_____	_____
e.	Net Profit	_____	_____
f.	Annual Depreciation	_____	_____
g.	Annual Return	_____	_____

Gives us the annual involved in the going and proposed plant

# Process Engineering Economics – *Economic Analysis*

Summary table for analysis of going and proposed plants

<b>B. Economic Evaluation</b>			
1	Break-even point _____ % capacity (a break-even chart or other graphical analysis are attached where desired)		
2	Financial and Economic Ratios		
a.	Current Ratio, current assets/current liabilities	_____	_____
b.	Fixed-Asset Worth Ratio, fixed assets(net)/networth	_____	_____
c.	Process investment ratio, process investment/total inv.	_____	_____
d.	Inventory ratio, inventory/net sales	_____	_____
e.	Networth ratio, networth/net sales	_____	_____
f.	Operating ratio, cost of sales/net sales	_____	_____
g.	Capital turnover, net sales/total investment	_____	_____
h.	Profit rate on sales, net profit/net sales	_____	_____
i.	Profit rate on worth, net profit/networth	_____	_____
j.	Profit ratio, total inv./net profit	_____	_____
k.	Economic rate of return	_____	_____
l.	Total Capitalized earning rate	_____	_____
m.	Process Capitalized earning rate	_____	_____
n.	Risk earning rate	_____	_____
o.	Economic pay out time, years	_____	_____
p.	Capitalized pay out time, years	_____	_____

Tells us the financial position and profit status of the company



# Process Engineering Economics – *Economic Analysis*

A. Data Schedule			
1 Investment			
a.	Preliminary Expenses		_____
b.	Process Investment		_____
c.	Service Facilities		_____
d.	Land and Buildings		_____
e.	Engineering Design		_____
f.	Construction		_____
g.	Preoperational Charges		_____
h.	Contingency Charge-might be included in previous items		_____
i.	Working capital, inventory and others		_____
j.	Others, Contractors Fee etc.		_____
		Total	_____
2 Annual returns at the capacity of _____ 75% 100%			
a.	Estimated sales at \$_____ per _____ Qty.	_____	_____
b.	Cost of Sales		
	(1) Variable	_____	_____
	(2) Fixed	_____	_____
c.	Gross Profits	_____	_____
d.	Profit tax at _____ %	_____	_____
e.	Net Profit	_____	_____
f.	Annual Depreciation	_____	_____
g.	Annual Return	_____	_____
B. Economic Evaluation			
1 Break-even point _____ % capacity (a break-even chart or other graphical analysis are attached where desired)			
2 Financial and Economic Ratios			
a.	Current Ratio, current assets/current liabilities	_____	_____
b.	Fixed-Asset Worth Ratio, fixed assets(net)/net worth	_____	_____
c.	Process investment ratio, process investment/total inv.	_____	_____
d.	Inventory ratio, inventory/net sales	_____	_____
e.	Net worth ratio, net worth/net sales	_____	_____
f.	Operating ratio, cost of sales/net sales	_____	_____
g.	Capital turnover, net sales/total investment	_____	_____
h.	Profit rate on sales, net profit/net sales	_____	_____
i.	Profit rate on worth, net profit/net worth	_____	_____
j.	Profit ratio, total inv./net profit	_____	_____
k.	Economic rate of return	_____	_____
l.	Total Capitalized earning rate	_____	_____
m.	Process Capitalized earning rate	_____	_____
n.	Risk earning rate	_____	_____
o.	Economic pay out time, years	_____	_____
p.	Capitalized pay out time, years	_____	_____

Complete  
Data Sheet

# Process Engineering Economics – *Economic Analysis*

## Table of evaluation of proposed operations

FORECAST OF EARNINGS AND RETURN ON CAPITAL	
PITTSBURGH COKE AND CHEMICAL COMPANY	
Estimate—New Production Facilities (Annual basis—\$000 omitted)	
Division _____	Plant _____
Product _____	
Productive capacity: _____; Basis _____ days/year	
Production rate: _____ % of capacity; _____ days/year; _____ lb /year	
Taxation basis: _____	
Depreciation basis: _____ years; or _____ % per year	
<b>A. Capital Requirements</b>	
1. Plant cost	
a. New facilities	\$ _____
b. Old facilities	_____
Total plant cost	\$ _____
2. Working capital	_____
Total	\$ _____
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<b>B. Gross Sales</b>	\$ _____
<b>C. Net Sales</b>	\$ _____
<b>D. Product Cost + General Expenses</b>	\$ _____
<b>E. Operating Profit</b>	
1. Before depreciation	\$ _____
2. After depreciation	\$ _____
<b>F. Income Taxes</b>	\$ _____
<b>G. Net Profit, after Taxes</b>	\$ _____

# Process Engineering Economics – *Economic Analysis*

## Table of evaluation of proposed operations

<i>H.</i> Return on Capital	
1. Before taxes	_____ %
2. After taxes	_____ %
<i>I.</i> Return on Gross Sales	
1. Before taxes	_____ %
2. After taxes	_____ %
<i>J.</i> Turn-over Ratio	
(\$ of Gross Sales per \$ of Capital)	_____ :1
<i>K.</i> Cash Accumulation	
(Profit Plus Depreciation)	
1. Before taxes	\$ _____
2. After taxes	\$ _____
<i>L.</i> Payout Time	
(Plant Cost: Cash Accumulation)	
1. Before taxes	_____ yrs.
2. After taxes	_____ yrs.
<i>M.</i> Break-even Point	
1. As % of productive capacity (100% market price)	_____ %
2. As % of market price (100% productive capacity)	_____ %

Additional references: \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

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# Process Engineering Economics – *Economic Analysis*

## Check list of information required for proposed plant

1. Material balances and flowsheets
2. Energy balances and flowsheets
3. Engineering flowsheets
  - a. Sizing of equipment—calculated or estimated—economic balance
  - b. Preparation of equipment lists showing purpose, location, description, material of construction, and cost, including stand-by service
  - c. Piping or materials-handling arrangements
4. Space layout
  - a. Equipment arrangement
  - b. Building sizing and design
5. Energy and service use survey—demands and utilization
6. Services requirement survey—generation and distribution
  - a. Steam
  - b. Electricity
  - c. Water
  - d. Others
7. Plant location and site development survey
8. Maintenance service survey
  - a. Warehouses and stores
  - b. Crafts and shops
  - c. Delivery, housekeeping, and others
  - d. Others
9. Process control survey
  - a. Instrumentation
  - b. Sampling techniques and equipment
  - c. Laboratory facilities required
  - d. Others

## Check list of information required for proposed plant

10. Survey of special facilities—space and equipment
  - a. Administrative, accounting, purchasing, personnel, legal, medical
  - b. Engineering
  - c. Research
  - d. Plant protection
  - e. Others
11. Manpower survey
  - a. Process
  - b. Laboratory
  - c. Service facilities
  - d. Maintenance
  - e. Special facilities
  - f. Unskilled
  - g. Others
12. Inventory surveys
  - a. Materials inventories
    - (1) Consumable raw materials, reagents, feed stocks, and others
    - (2) In-process inventory—semifinished product
    - (3) Finished product
  - b. Nonconsumable supplies (including nonconsumables in process)
    - (1) Solvents
    - (2) Carriers
    - (3) Catalysts
    - (4) Adsorbents

## **13. Direct operating cost survey**

- a. Raw materials, including any make-up or losses of nonconsumable supplies**
- b. Direct labor**
- c. All services**
- d. Process control costs that are estimated separately, as laboratory costs, royalties**
- e. Others that cannot be related to the above or to fixed investment**

## **14. Fixed cost survey**

- a. Taxes, insurance, and others which can be estimated separately**
- b. Overhead, management, and selling expenses which can be estimated separately**

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