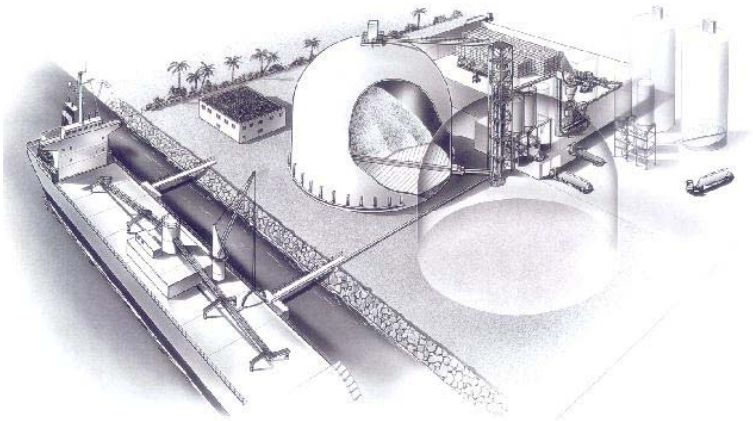
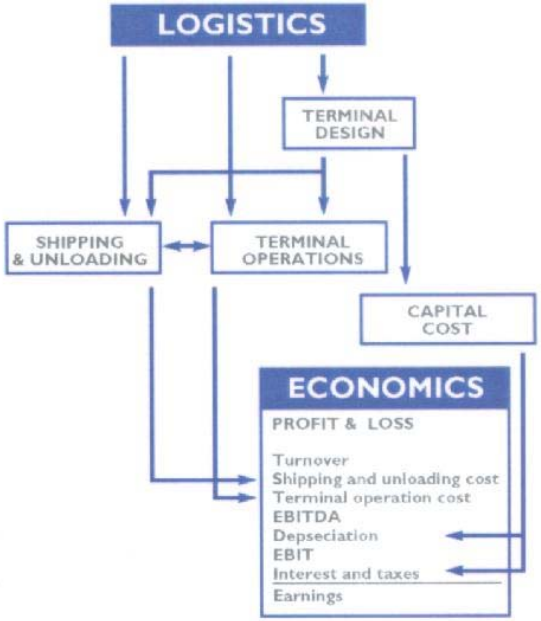




Economical modelling of cement terminals as a means to reduce capital and operating costs

INTERCEM Workshop

Ad Ligthart
Cement Distribution Consultants

CEMENT DISTRIBUTION CONSULTANTS

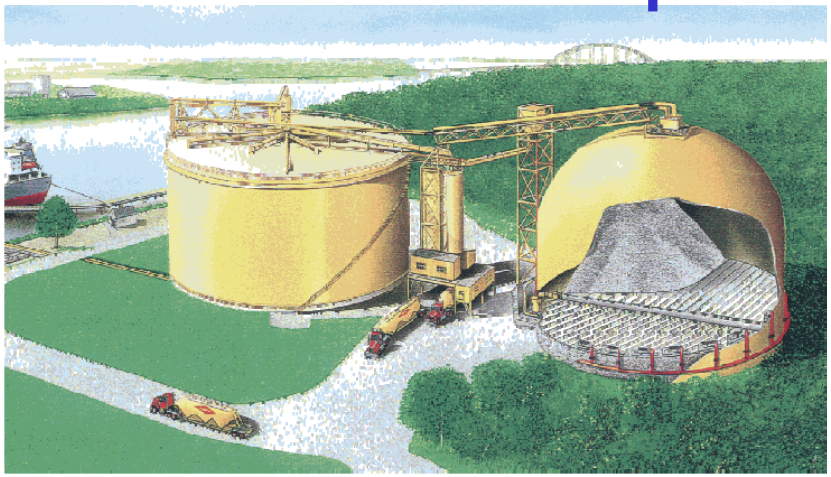
Economical modelling of cement terminals as a means to reduce capital and operating costs

Contents of presentation

- Bring all cost factors into perspective: develop a logistical and economical calculation model
- Set-up of the calculation model
- Overview of individual cost factors and their impact on the overall import operations
- Effect of annual throughput on terminal costs
- How to apply capital costs
- Use of calculation model to reduce costs
  - reducing capital costs
  - reducing operation costs
  - comparing alternatives
- Conclusions

Shipping

Ship unloading

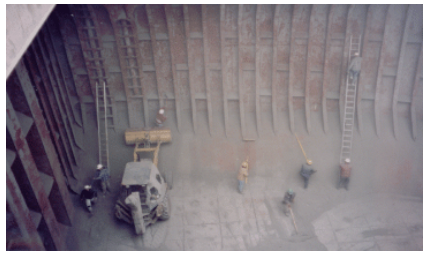


Storage and reclaim

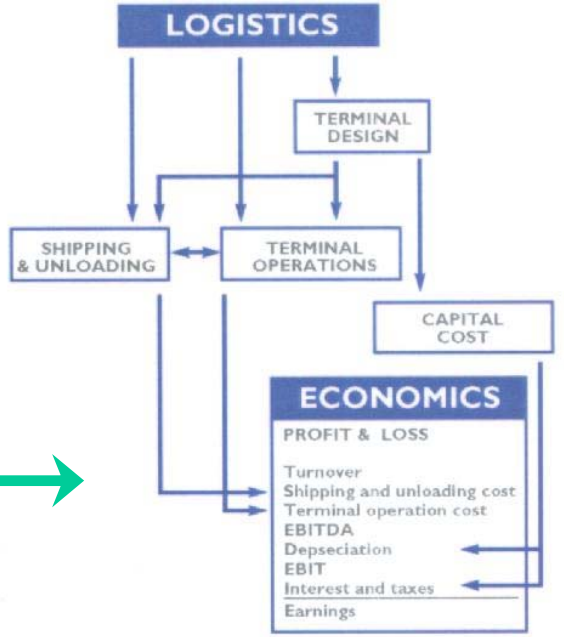
Blending

Bagging

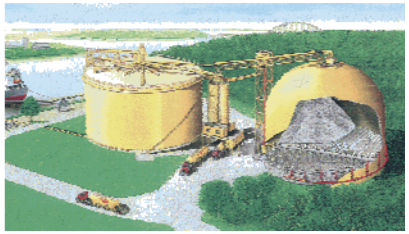
Distribution



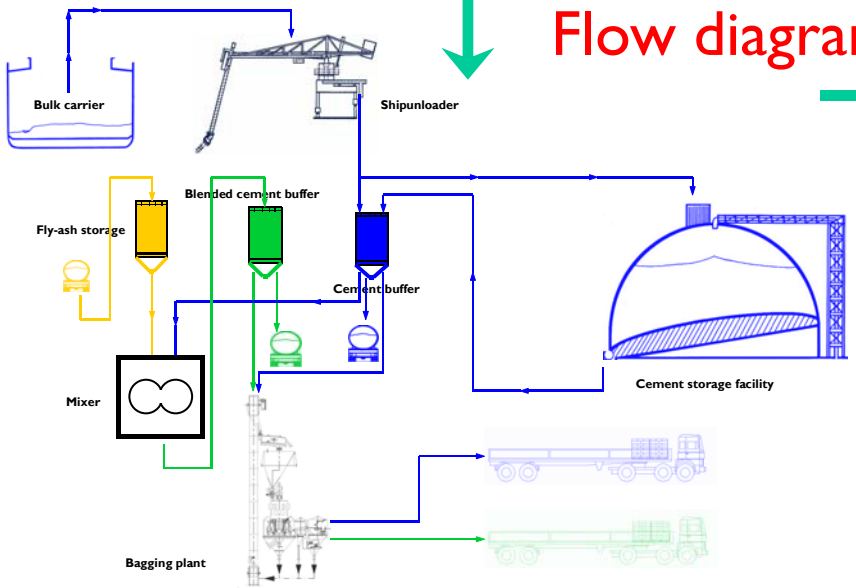
Calculation model



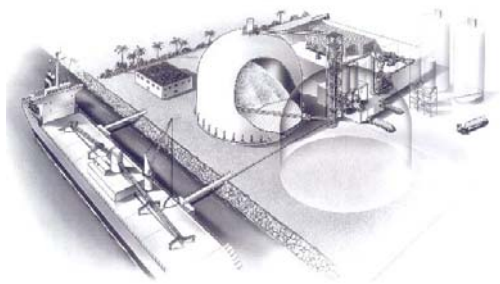
Required operations

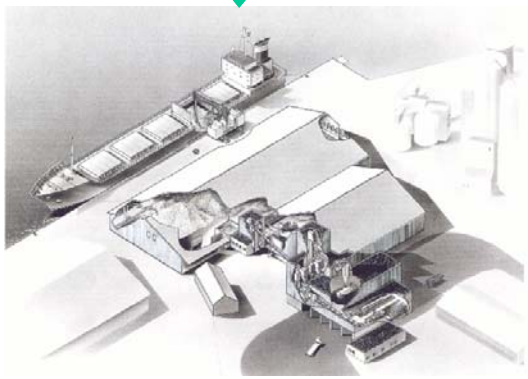


Flow diagram

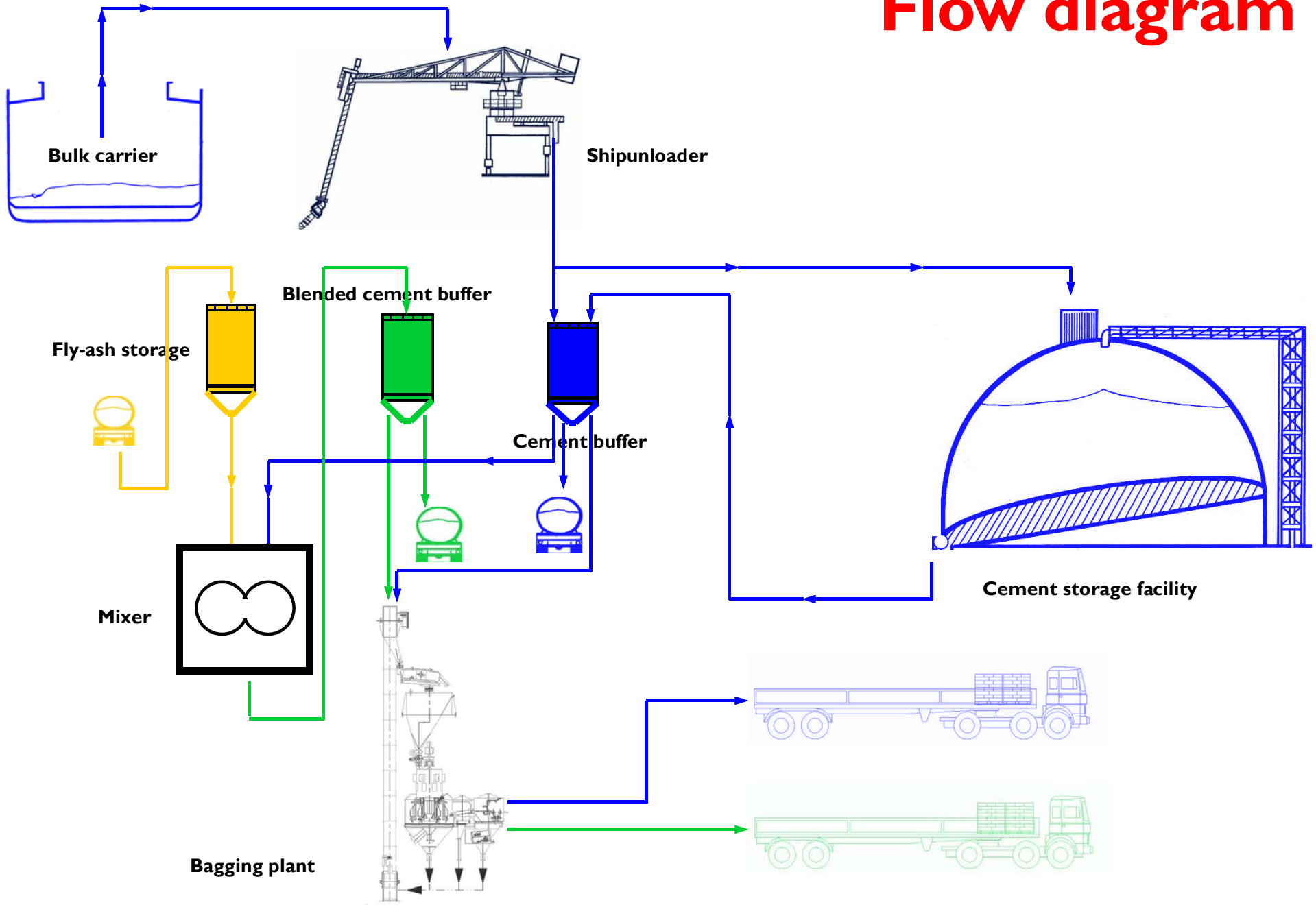


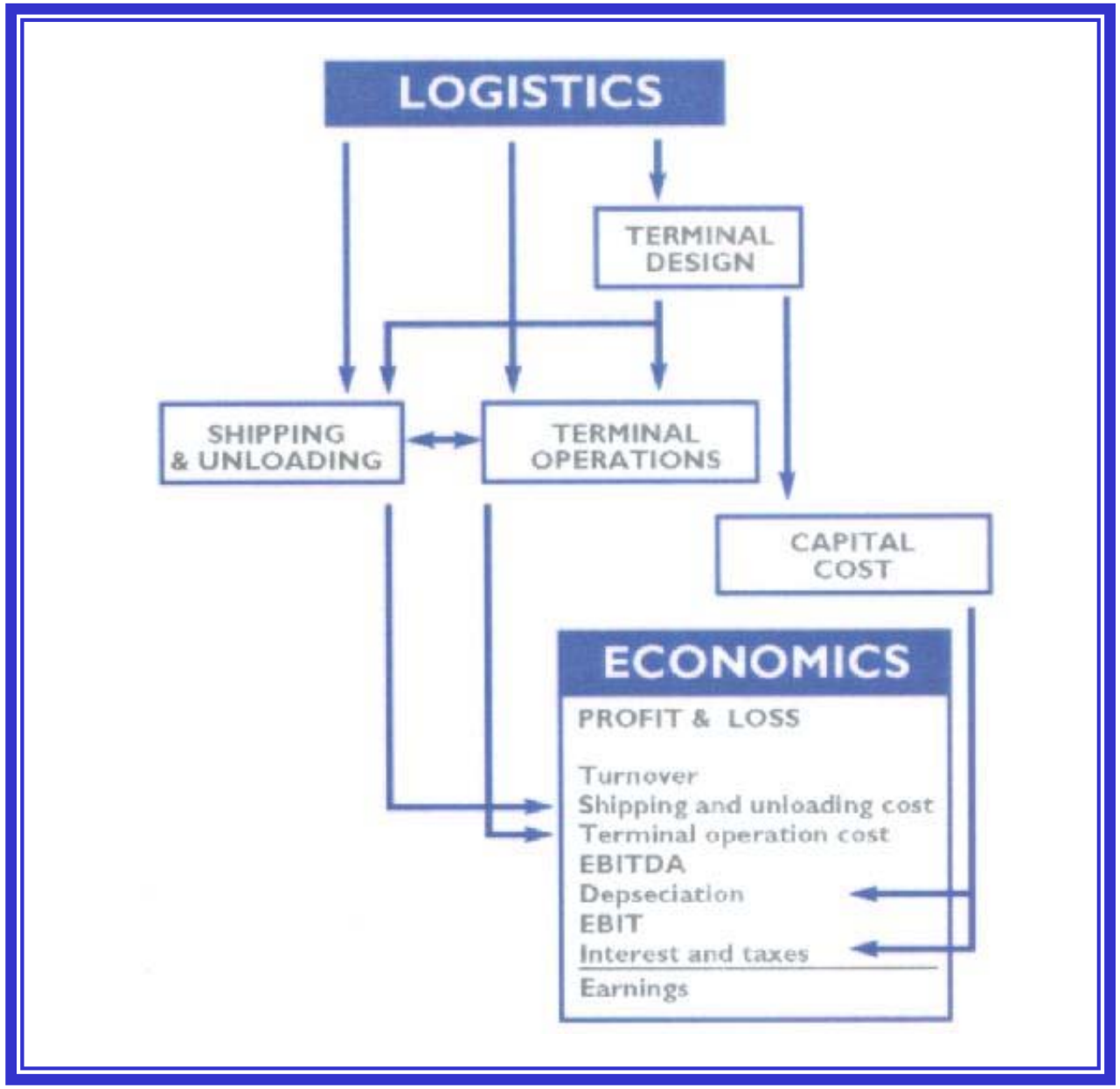
Terminal concept





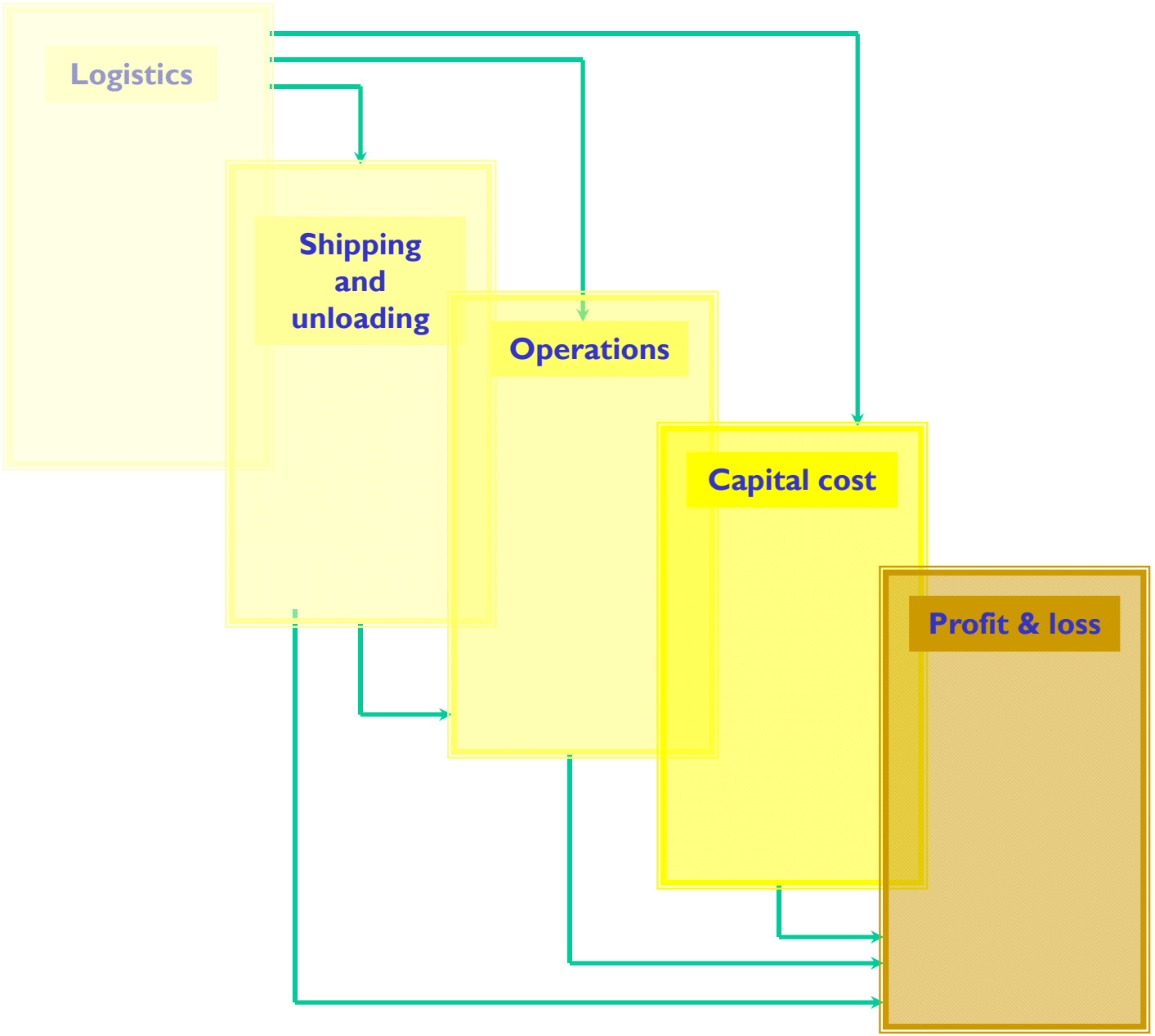
Flow diagram





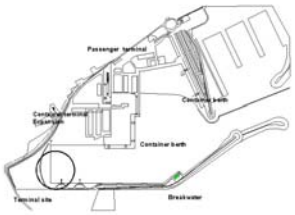
Calculation model

“3D” Spreadsheet calculations

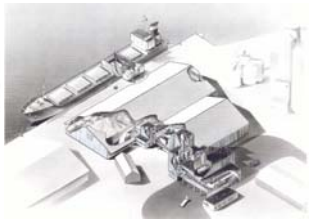


Logistics

Market requirements



Site characteristics



Storage and equipment alternatives

Transportation alternatives

Required cement types
Bag / bulk ratio
truck / rail / barge distribution
Terminal opening hours
Dock situation
Convey distances
Storage and equipment efficiencies
Ship size / type
Unloading efficiencies

Shipping requirements
storage and equipment capacities
Equipment operating hours
traffic situation
etc.

Shipping and unloading

Logistics

Frequency

unloading time

Dock occupancy

Labour hours

Power consumption

Costs

Cement FOB

Shipping cost

Import duties

Unloading cost

Labour

Energy

Cleanup

Maintenance

Demurrage

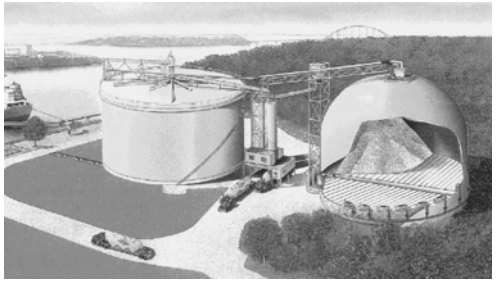
Wharfage / stevedoring

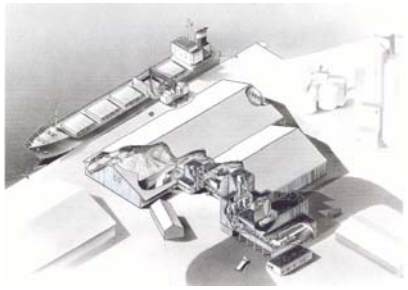
Operations

- Power consumption
  - Equipment running hours
  - Power consumption per equipment
  - Overall power consumption
- Labour
  - Required shifts
    - reclaim
    - blending
    - bagging
    - distribution
- Maintenance
  - Based on time
  - Based on throughput
- Front-end loader costs (flat storage)
- Site lease

Cost allocation
- Type (blending)
- Bulk / bag
- Distribution

Overhead costs





Capital cost

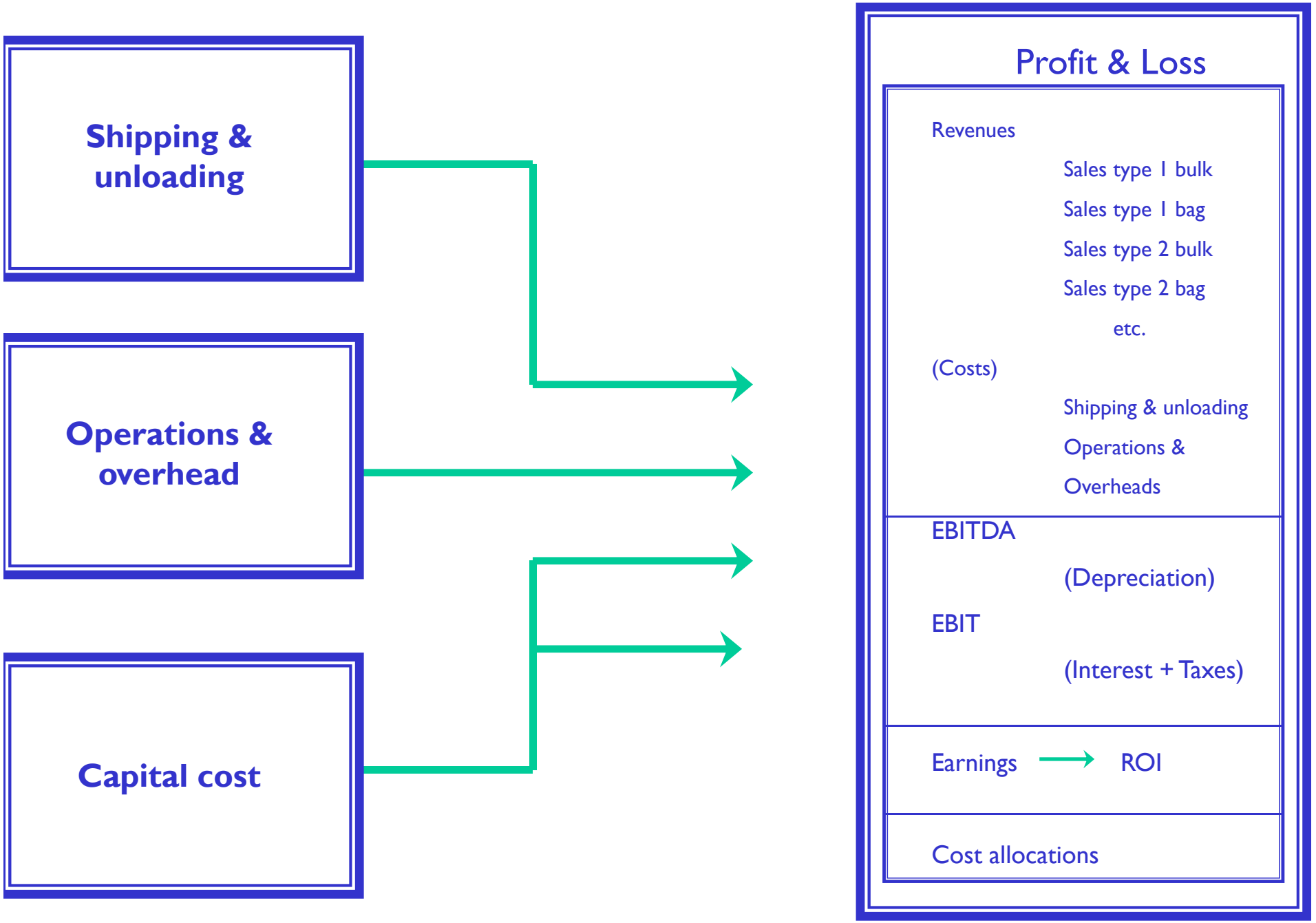
- Site infrastructure
- Foundations / piling
- Ship unloading system
- Storage facility
- Convey systems
- Blending / bagging equipment
- Buildings
- Distribution facilities
- Electrical / automation
- General contractor costs
- Overheads
- Contingency

TOTAL PROJECT COST

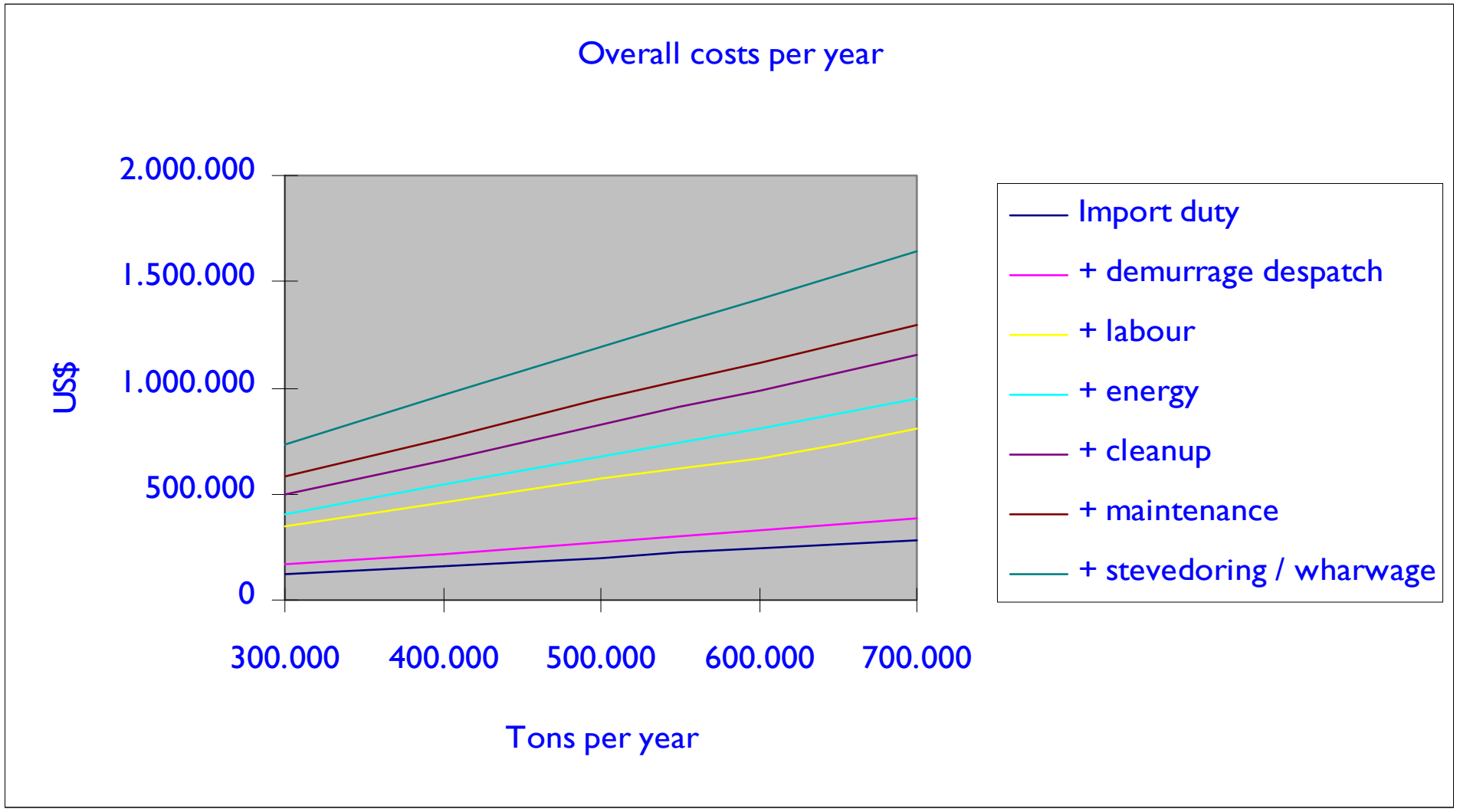
Depreciation

Interest cost

Cost allocations

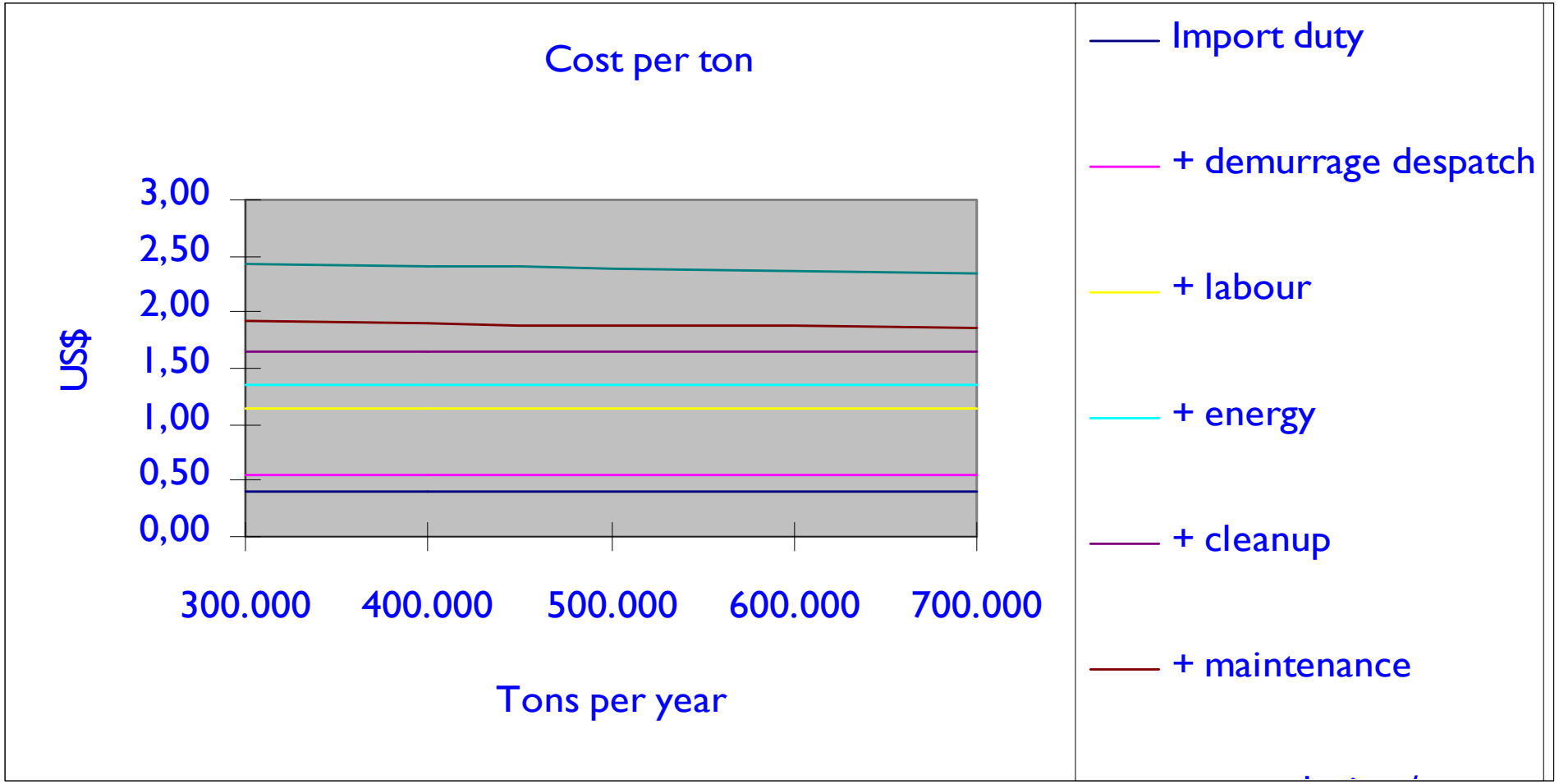

Shipping & unloading
Operations & overhead
Capital cost
Profit & Loss
Revenues
Sales type 1 bulk
Sales type 1 bag
Sales type 2 bulk
Sales type 2 bag
etc.
(Costs)
Shipping & unloading
Operations & Overheads
EBITDA
(Depreciation)
EBIT
(Interest + Taxes)
Earnings
ROI
Cost allocations

Effect of increasing throughput



Ship unloading

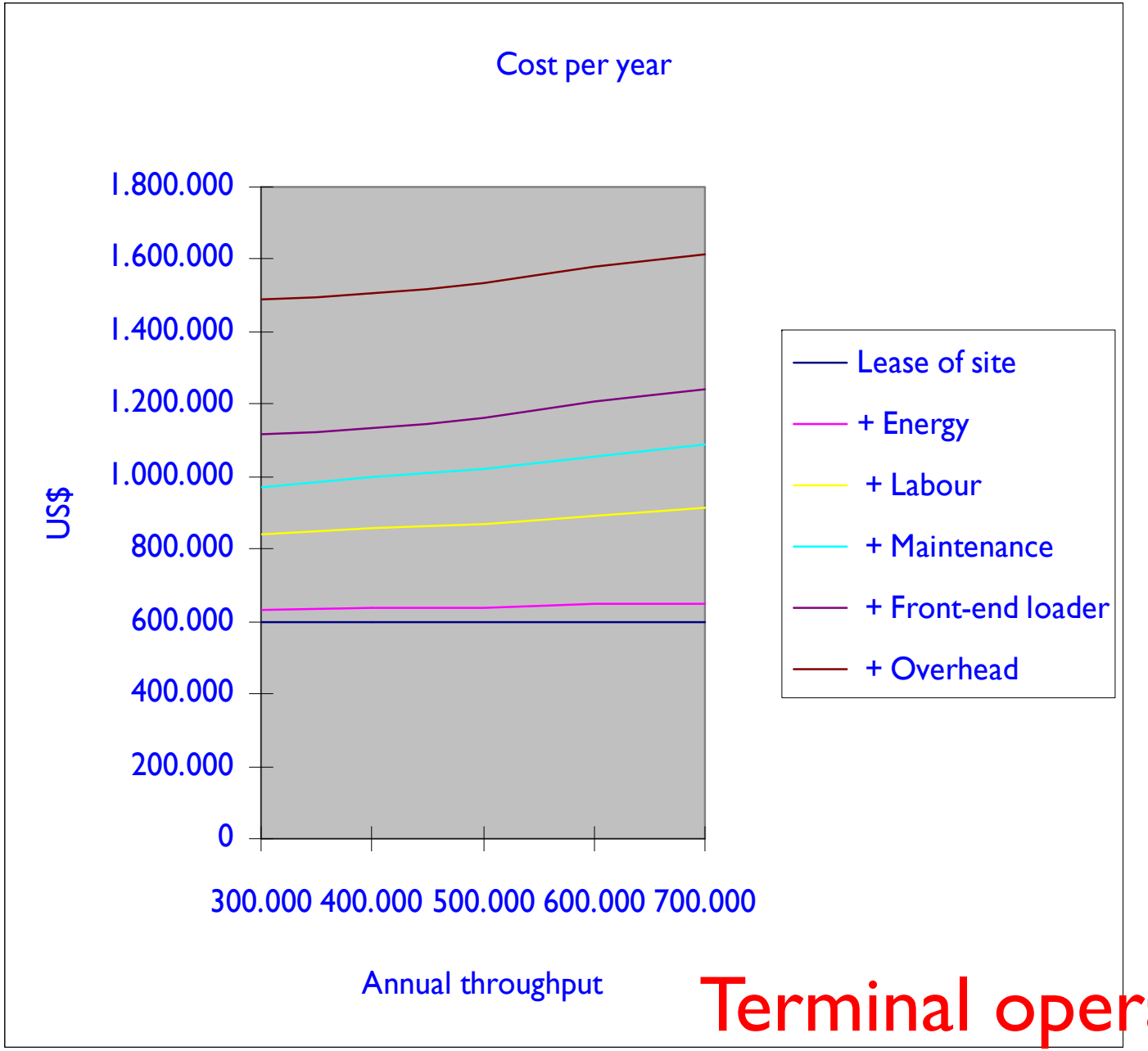
Effect of increasing throughput



Ship unloading

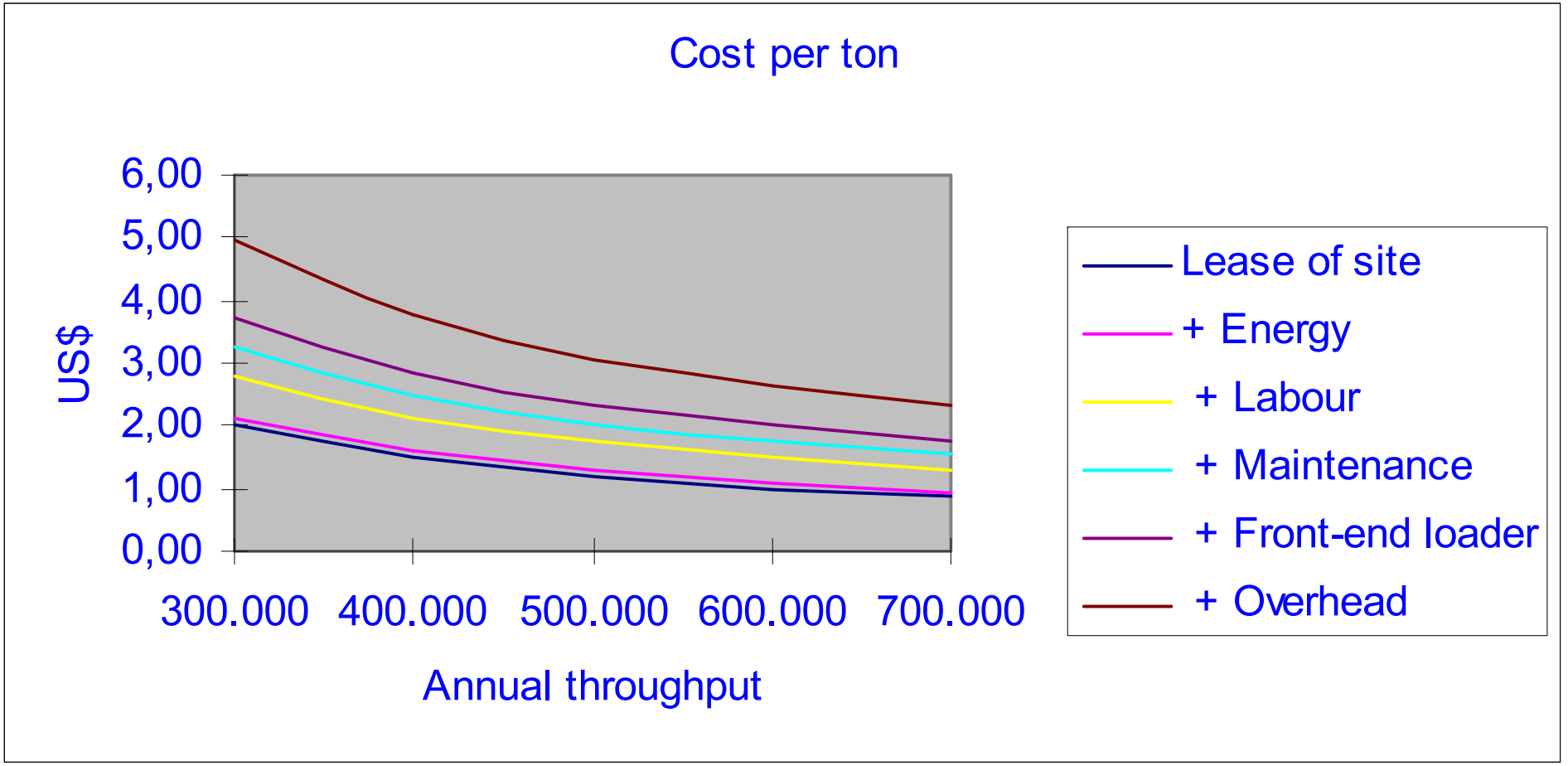
The operational costs per ton of shipunloading are almost equal, irrespective of annual throughput

Effect of increasing throughput



Terminal operations

Effect of increasing throughput

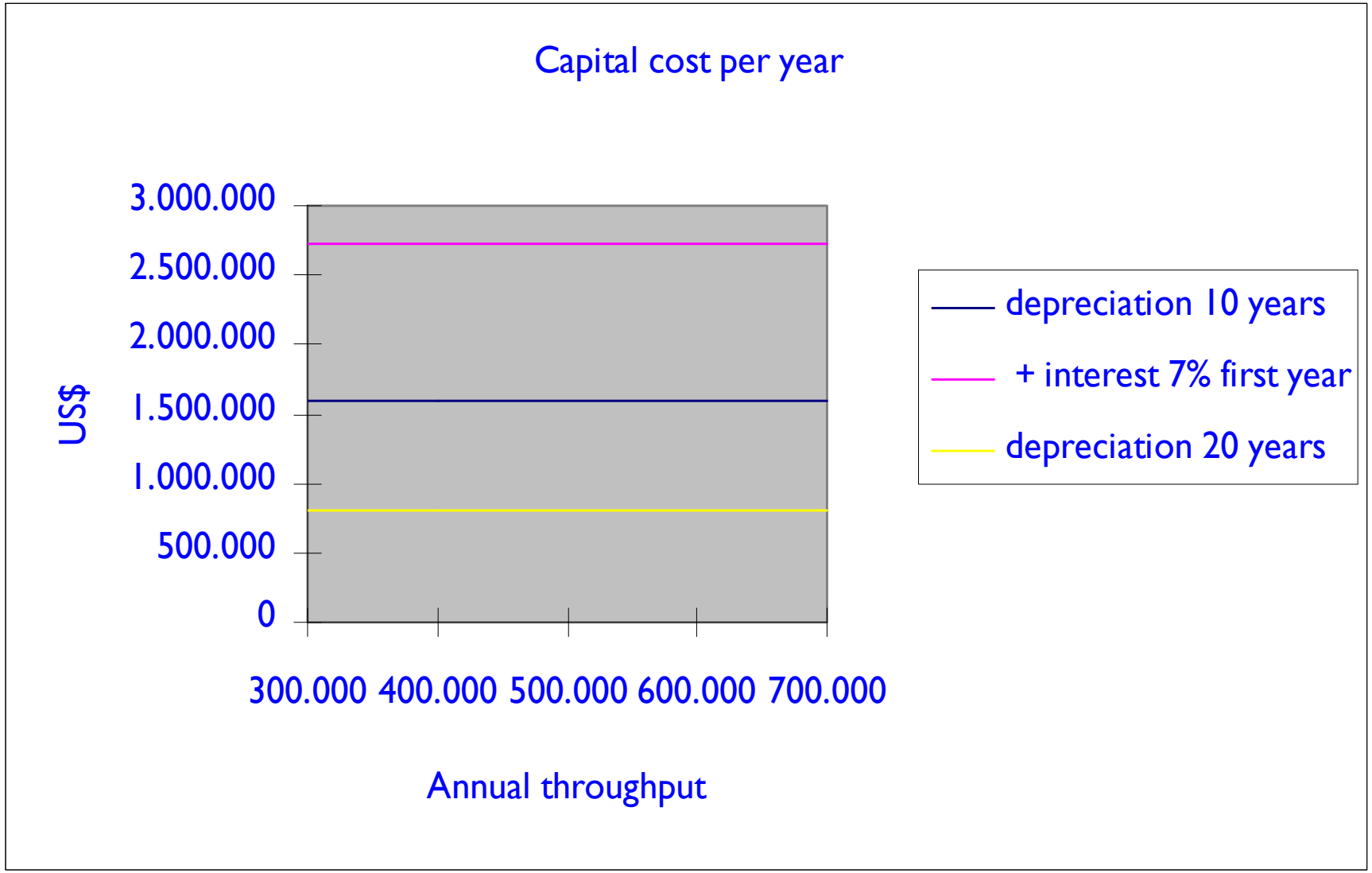


Terminal operations

Terminal operational costs are highly dependent on annual throughput

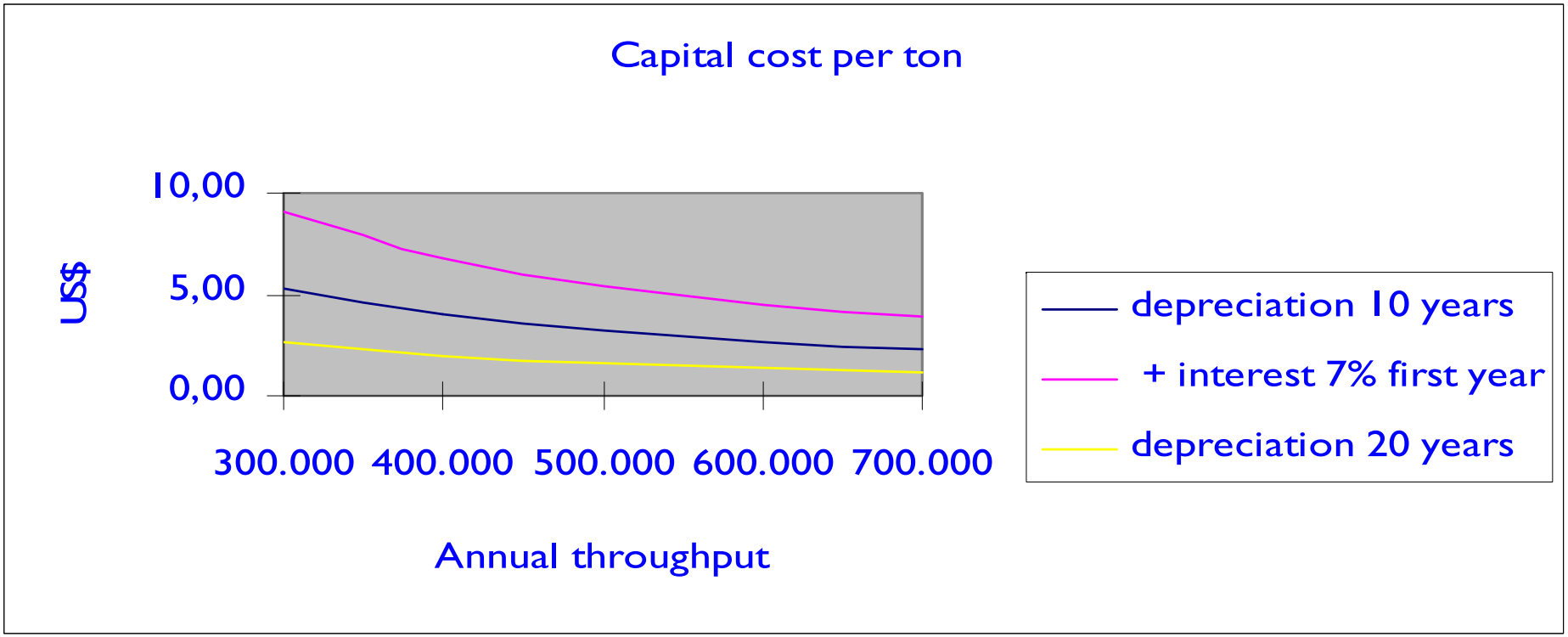
Higher annual throughputs strongly reduce terminal operational costs per ton

Effect of increasing throughput



Capital cost

Effect of increasing throughput



Capital cost

- Capital costs can vary very substantially depending on the application

1) Long term depreciation versus short term payback period

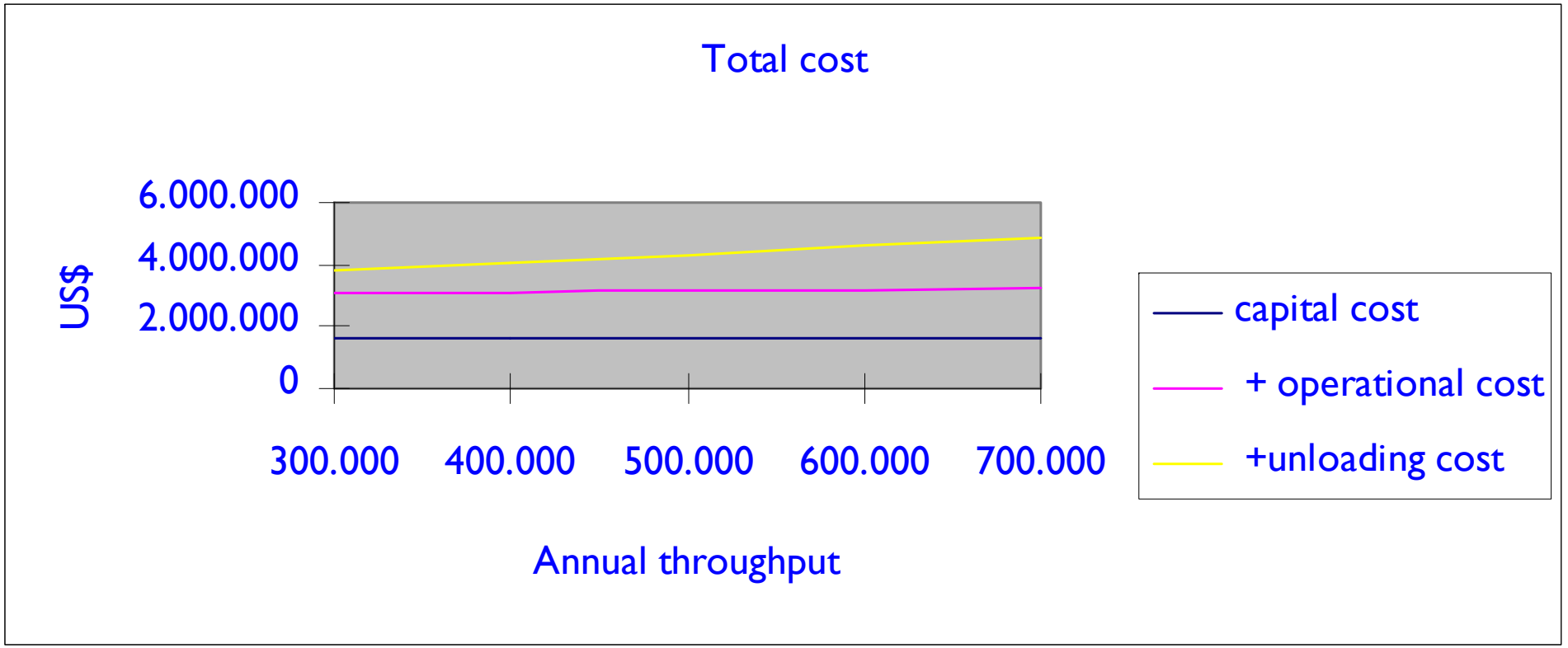
2) Cost of money

Interest cost

Return on Investment

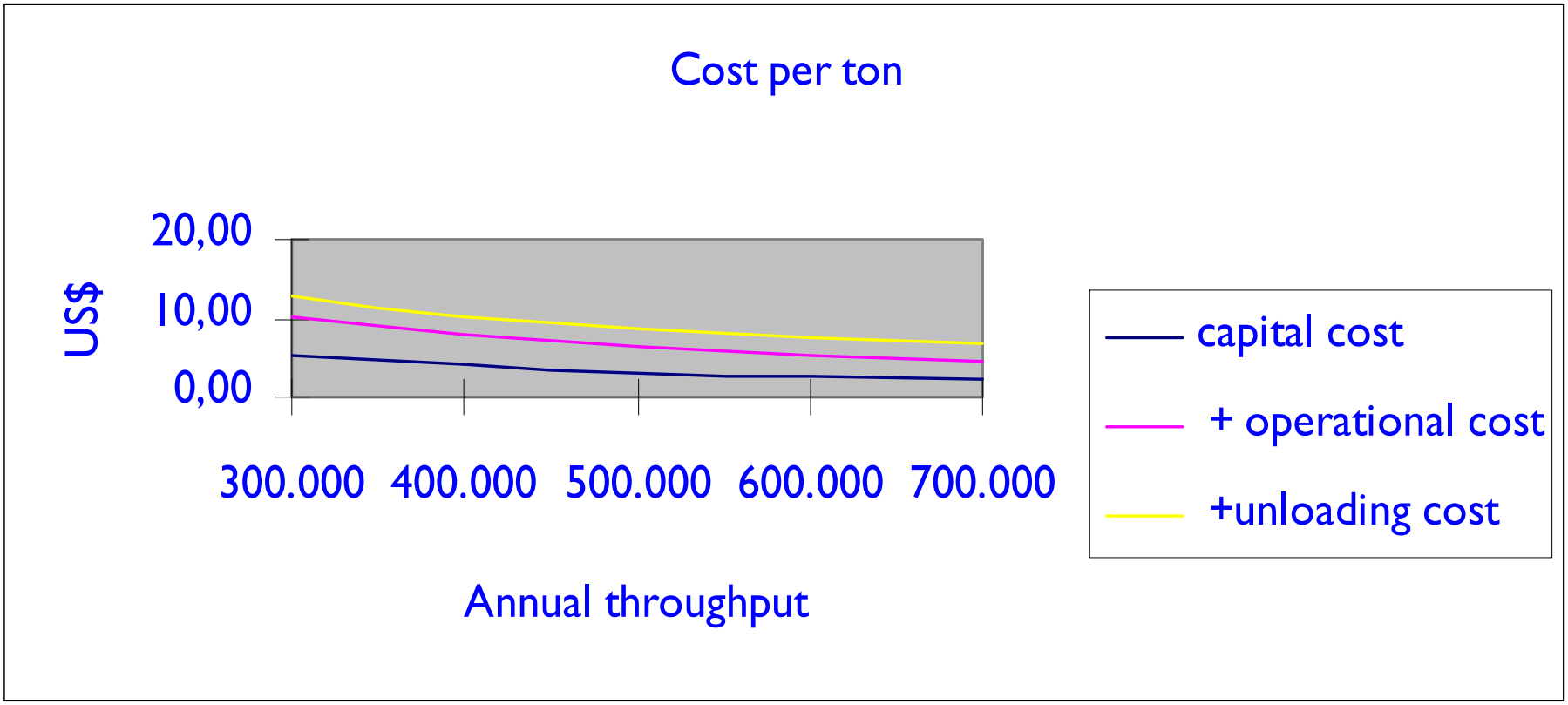
- Capital costs drop pro rata with increased annual throughput

Effect of increasing throughput



Total cost

Effect of increasing throughput



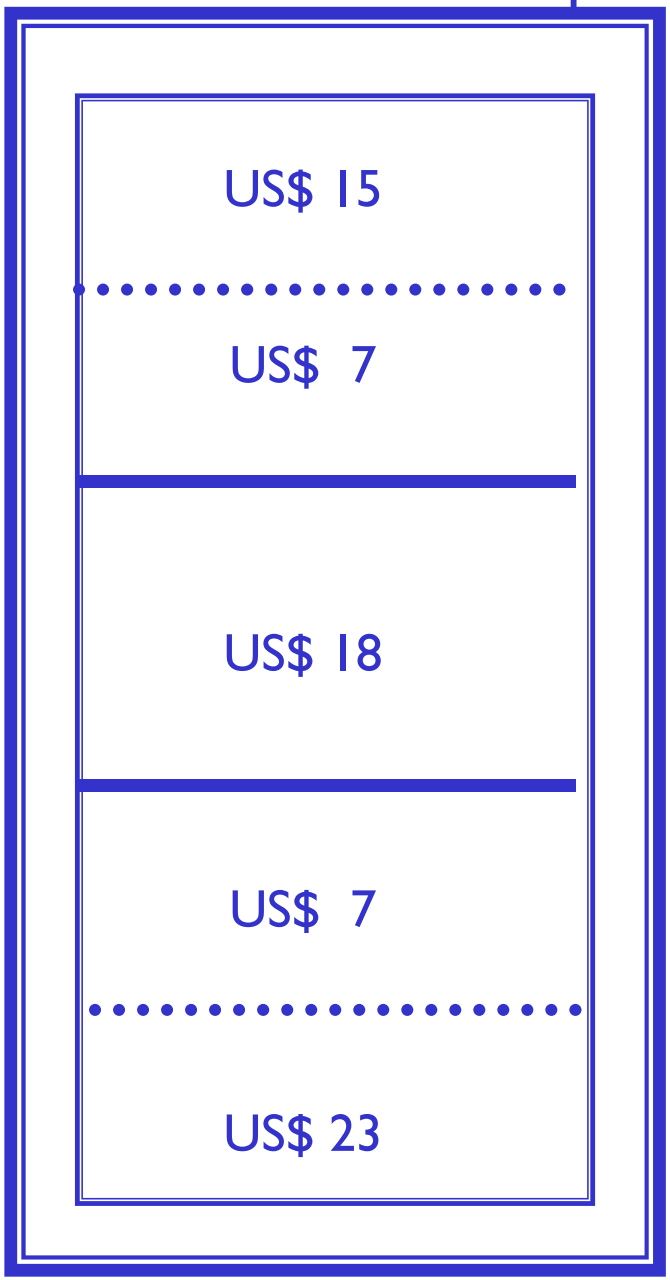
Total cost

Use of calculation model to reduce cost

- Reduce capital costs
- Reduce operational costs
- Compare alternatives

How important are terminal operating costs?

Example:
Large terminal USA
Throughput 500.000 tpa
Cement from Asia



Cement production cost

Margin towards capital cost / profit cement plant

FOB price US$ 22

Shipping cost

CIF price US$ 40
Shipunloading
and terminal operating cost

Margin toward
Capital costs / profit terminal

Sales price US$ 70

Approx. 66 %

Approx. 10 %

Example only

!

For a cement import operation there are three factors that really matter

- Cement price F.O.B
- Shipping cost
- Sales price cement ex terminal

Look at the past 15 - 20 years to see how much these factors have fluctuated. Based on that best case and worst case scenarios can be prepared.

Reducing capital costs

Where does the capital cost go to?

1. Key terminal facilities (shipunloader, storage facility / reclaim system, truckloadout)
2. Secondary terminal equipment (conveying equipment, intermediate buffer storage)
3. Support systems (electrical, plant air, steel support structures)
4. foundations and piling
5. Infrastructure (roads, power supply, utilities, drainage, etc.)
6. Overheads (general contractor costs, engineering, project management)

Good terminal design only partially consists of selecting the optimal key facilities

Good terminal design mainly focuses on reducing secondary terminal equipment, support systems, foundations and piling, infrastructure and overheads!!!

Reducing capital cost without sacrificing storage size or equipment performance

- "No piling" solutions
- Optimal use of existing infrastructure
- Terminal design based on logistics and economics
- Make optimal use of engineering from contractors and equipment suppliers
- Be your own general contractor and project manager

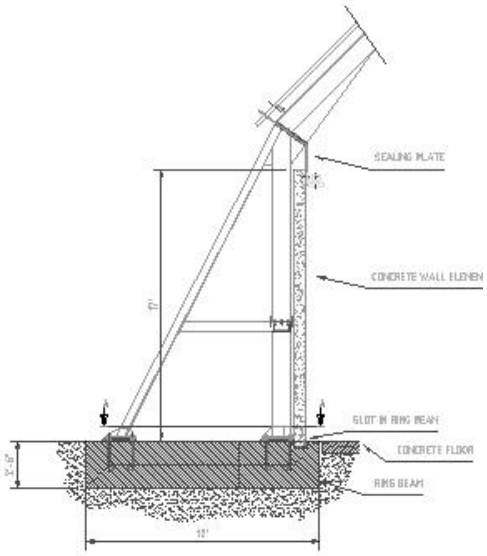
Reducing capital cost

"No piling solutions"

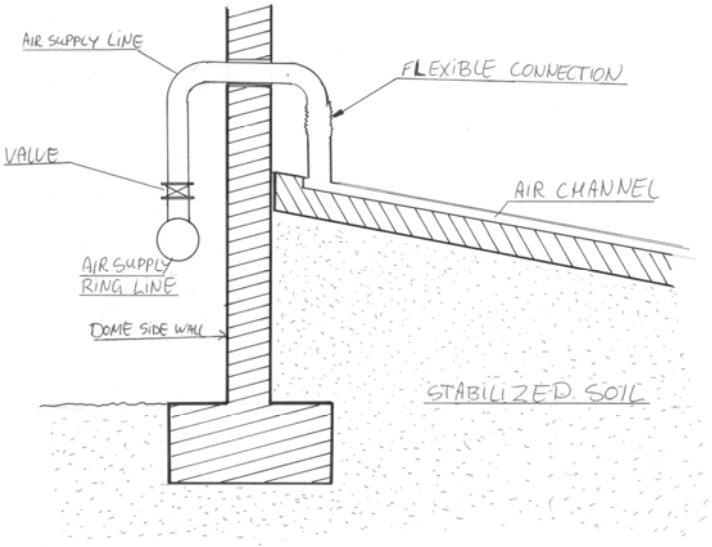
Ringbeam foundation
for storage facility

Floating floor for cement load

Allow settlement !



Flat storage

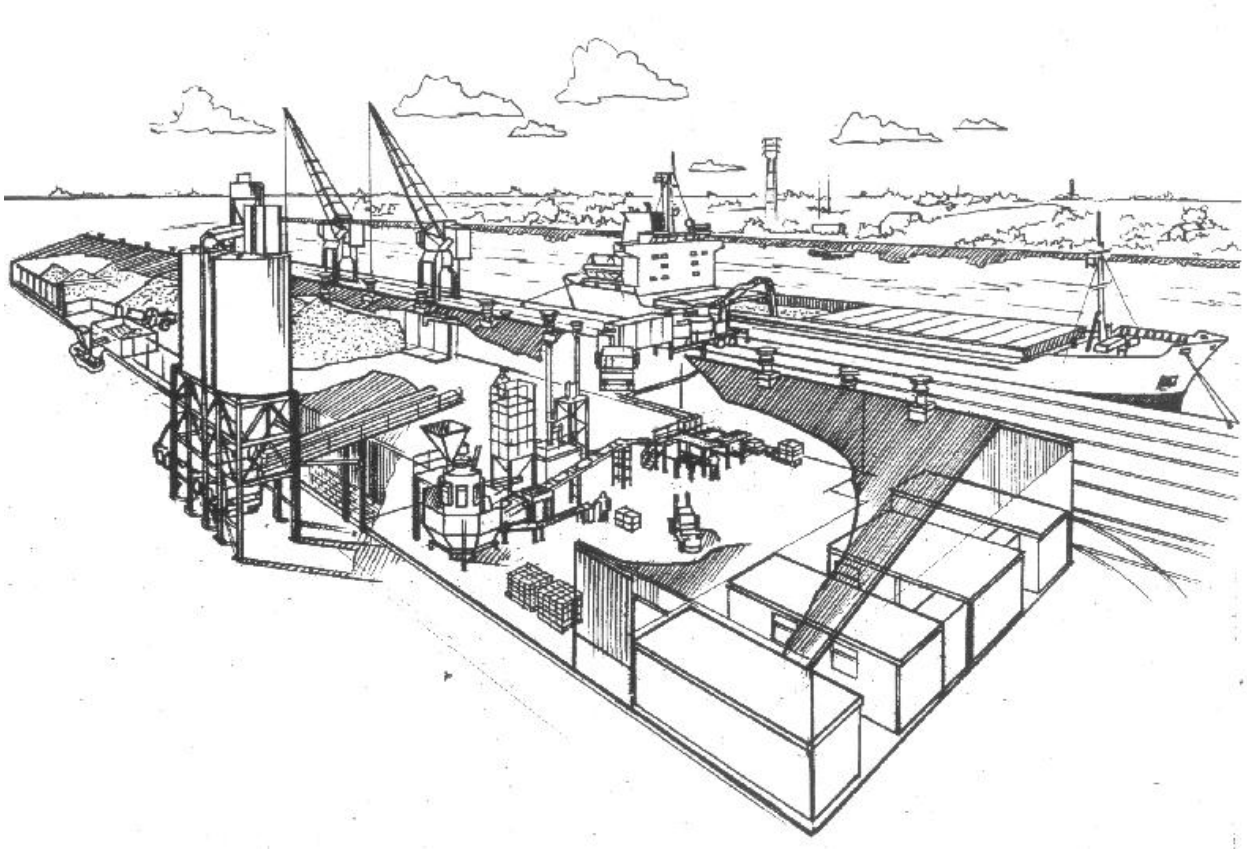


Dome storage

Reducing capital cost

Optimal use of existing infrastructure

- Roads / paved areas
- Power supply
- Foundations
- Dewatering
- Utilities
- Buildings



Reducing capital cost

Terminal design based on logistics and economics

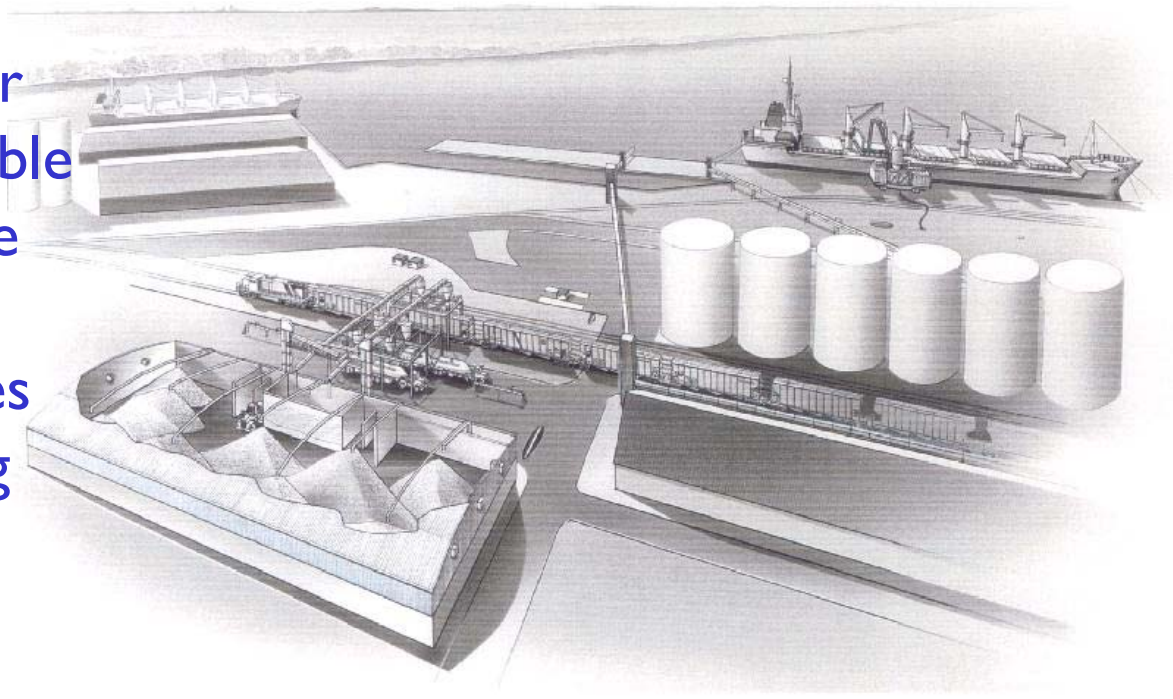
Get the cement through the terminal with a minimum of handling and intermediate storage

!

Reducing capital cost

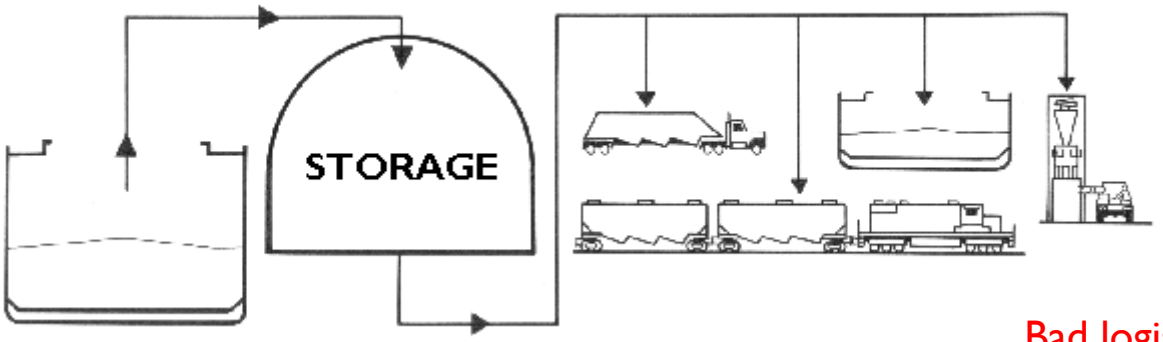
Terminal design based on logistics and economics

- Avoid intermediate buffer storage as much as possible
- Use a single main storage facility
- Short conveying distances
- Group vertical conveying together
- Build compact !

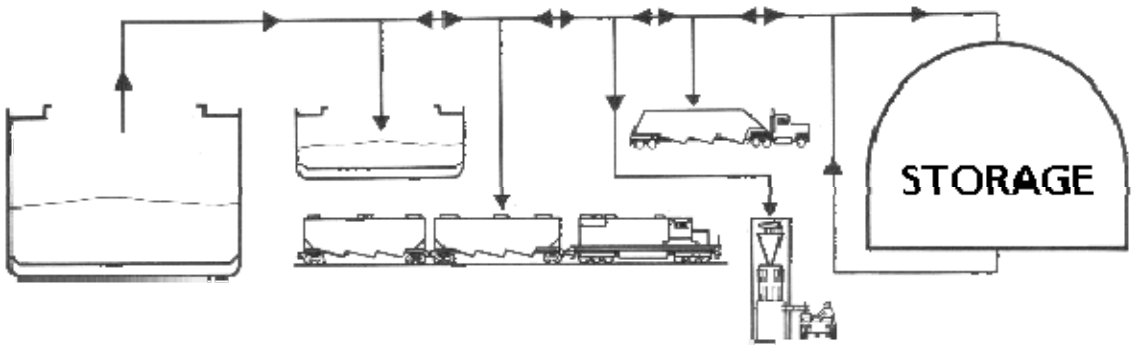


Reduces both capital and operational costs

Optimising logistics



Bad logistical concept



Better logistical concept

Reducing capital cost

Make optimal use of engineering from contractors and equipment suppliers.

When properly co-ordinated over 80% of engineering can be supplied by contractors and equipment suppliers at no or very low cost.

Reducing capital cost

Be your own general contractor and project manager.

Saves 10 - 20% but this does require experience!

A different perspective on terminals

Independents

• Make money only on "one side of the ocean"

•Capital cost of terminal is high compared to their ready mix / concrete plants

•Relatively low market control (short term payback required)

•Focus on capital cost

Low capital cost terminal design which is often innovative

Multinationals

• Make money on the whole operation

- export plant
- trading
- import operation

•Capital cost of terminal is low compared to their cement plants

•Relatively high market control (long term project)

•Focus on "proven" design

Traditional terminal design, often at high capital (and operational) cost

Reducing operational cost

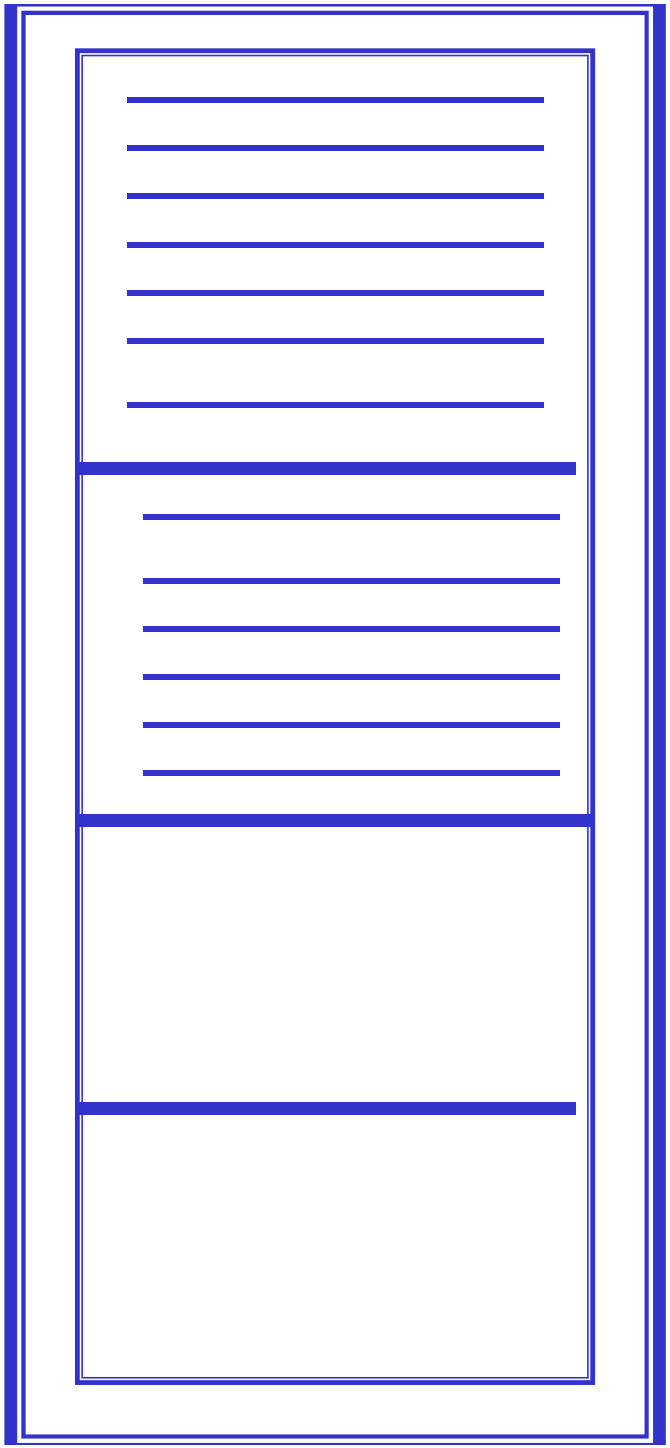
- Terminal design based on logistics and economics
- Bring terminal activities and labour shifts in line with each other
- Subcontract irregular work
- Reduce terminal operations to one shift per day whilst enabling 24 hr/day despatch
- Focus on planning and good organisation

Shipunloading

Terminal operations

Depreciation

Interest



Import duty
demurrage / despatch
Labour
Energy
Cleanup
Maintenance
Wharfage

Site lease
Energy
Labour
Maintenance
Front-end loader
Overhead

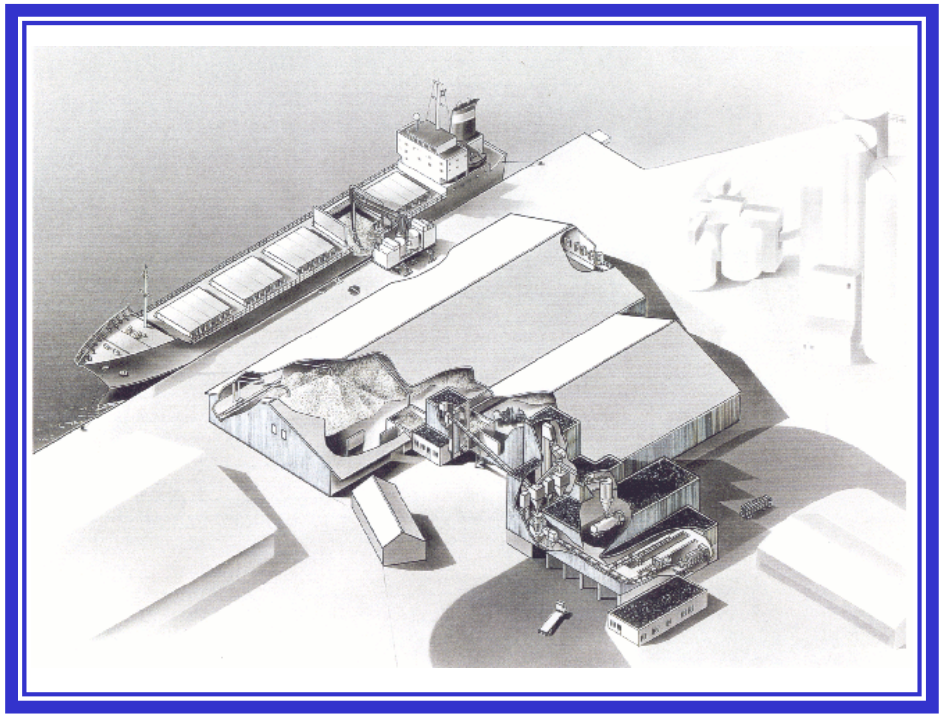
Terminal costs

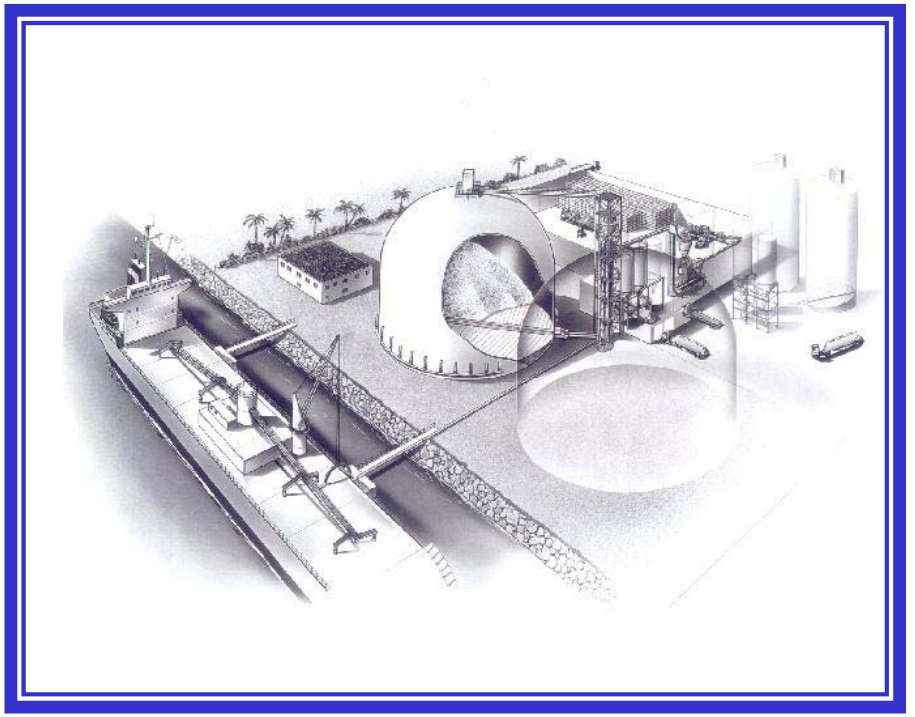
- Operational costs are subdivided in many relatively small components. Just focussing to improve one or two of them has hardly any impact

- Operational costs are directly linked to capital costs. Terminals with a high capital cost in general also have a high operational cost

- To reduce capital and operational costs a terminal design is required that focuses on logistics and economics

Comparing different design, storage facility and equipment alternatives





The calculation model allows for comparisons providing the effects on the complete terminal operation

Conclusions

- A cement import operation has many factors that influence its performance
- All these factors and their relation with each other can be put into perspective using a logistical and economical calculation model
- Capital cost and operational costs have a direct relation with each other, which is shown in the model
- Optimal terminal design is based on the specific logistics and economics of that operation and not on "proven" concepts.
- Optimal terminal design strongly focuses on reducing the costs of secondary terminal equipment, support systems, piling and foundations, infrastructure and overheads.