

ICR article draft

Assessing investment costs

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Whether building a greenfield plant or expanding an existing facility there are many key decisions that need to be taken in terms of project management to reduce overall investment costs. Consultancy experts SAXUM shares its experience in such situations for the cement industry and reveals some common areas where savings can be made, particularly for the Brazilian cement sector.

The strong growth of the Brazilian cement industry in recent years is reflected in the large number of greenfield and brownfield projects across the country. The cement industry is 'capital intensive' and making the wrong decision in terms of timing and amount of investments can have severe consequences for companies.

Project characteristics

Projects generally share the following characteristics:

- Investment decisions are delayed as much as possible until they become 'critical' so company growth is not affected
- Once investments are approved, project teams typically receive three important guidelines:
 - 1) minimise capex or postpone minor investments which can be financed with cash flows generated by the project
 - 2) minimise project execution time
 - 3) minimise operating expenses while keeping high levels of reliability.

Below SAXUM highlights key areas in the engineering decision-making process that can reduce capital expenditure, followed by an example of a specific case study.

Supplier selection

The first factor to ascertain is who the main technology supplier should be in light of a project's capital and operational expenses. However, it is important to note that the cost of equipment in a cement project is not the main expense. In Brazil's current economic



situation, this is much more noticeable due to high construction and erection costs. Table 1 shows the average distribution of investment costs in the world compared to Brazil in recent years.

A trusted engineering partner

It is clear then that the focus should be on reducing construction and erection costs. It is during the engineering stage that the technology, type of construction, adaptability to local conditions and to Brazilian standards should be defined – all of which impact the project's success

in terms of cost and the time required for completion. These factors also influence the project's operational stage. That is why it is critical to select a 'partner' with the appropriate expertise and experience.

An experienced engineering partner is able to offer optimised solutions through the:

- appropriate selection and optimal sizing of equipment
- development of alternative implementation options
- analysis of natural terrain.

All this must be achieved without compromising operations, efficiency and accessibility of the plant. It is also important to maintain the flow and safety of personnel working within the plant, while delivering well-researched solutions to achieve lower construction and erection costs.

Equipment selection

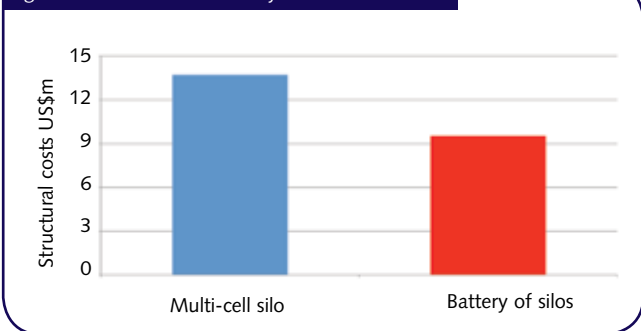
In terms of the production process, the selection of technology, size of the equipment, or the intermediate stocks, can often drive up investment costs.

In a cement company, those

Table 1: distribution of investment costs, Brazil compared to rest of world

	World (%)	Brazil (%)
Equipment	40	25
Construction & erection	45	60
Management	5	6
Engineering	5	4
Others	5	5
Total	100	100

Figure 2: multicellular v battery silo structural costs



responsible for selecting the technology to be employed and the size of the plant are often responsible for its operation. However, plant operators are also critical to the decisions being made as they will ultimately be responsible for running the plant. Therefore they should be involved in the decision-making process at the design stage. However relying exclusively on operating sector for guidance can result in the over sizing of equipment.

Sometimes the degree of automation required is also not available where the project is being developed. All of these decisions can become areas of conflict with the financial needs of the investor.

Case study

Cement silo storage comparison

Over the past two decades there has been a strong trend towards using multicellular silos to store cement. While this system has important advantages, such as capacity and flexibility for customers, an in-depth analysis of its impact on the project's capex had not been conducted.

SAXUM therefore carried out comparative studies on construction costs on a 32,000t capacity multi-cell silo with seven chambers compared to a battery of silos with identical storage capacity.

The comparison of structural costs for both silo systems is indicated in Figure 2. In the cost analysis of both silo types the foundation soils were considered of standard quality. Considering structural costs only, SAXUM found silo batteries to be approximately 40 per cent less expensive than multi-cell silos. This is an important factor to consider before making a final decision on the

cement silo system to be implemented.

SAXUM recommends performing a trade-off analysis to evaluate the capex involved in these two cement storage alternatives. Not only should structural costs be considered but so too should their loading/unloading systems, as well as the space required for their structures (eg, taking into account the larger space requirements of the silo battery).

Thinking outside the box

SAXUM's experience shows that if a factory is operated with reasonable levels of efficiency, especially in terms of reliability of plant equipment, it can

Table 2: KPI to reduce investment costs

KPI	Fair value
Mills reliability factors	>95%
OEE mills	85% over 8760h/annum
Kiln reliability factor	>97%
OEE kiln	85% x 365 days

Table 3: design concepts

	Traditional concept	Low cost and efficient plant
Pre-homogenisation storage capacity (days)	7	5
Pre-homogenisation limestone bin at raw mill (h)	4	2
Additives bins at raw mill (h)	8	5
Homogenised raw meal stock (days)	2	1.2
Raw mill overcapacity (%)	25	15
Cement mill overcapacity (%)	25	15
Cement silo storage (days)	7	5

Latin American experience

SAXUM has a long and successful history of helping cement producers develop the best plant designs available thanks to its team of experienced and specialised engineers and the use of advanced technological tools.

The company has an extensive experience in Latin America providing technical consultancy services (including feasibility studies, technical support for technology analysis and vendor selection, vendor engineering design revision), as well as engineering designs in all disciplines for complete plants.

Through its offices in Argentina and Brazil, SAXUM has developed projects in the recent years for producers including Brazilian producers InterCement, Votorantim, CSN, Cimento Itambé and Cimentos da Bahia as well as Cementos Argos (Colombia) and Cementos Yura (Peru). For further information, see: www.saxuming.net

accrue significant savings in investment, with respect to the traditional concepts of determining the size of stocks and equipment. Table 2 shows some Key Performance Indicators (KPI) which although, can be improved to meet the standards of a world class plant, can help with considerable savings on investment.

These KPIs allow us to reevaluate some the design concepts that have been used in cement plant for years. It is not worth making savings on auxiliary equipment (such as conveyor belts, elevators), etc since they have minimal impact on the cost but a high impact on plant efficiency.

The measures outlined by SAXUM in this article are particularly valid in Brazil, where construction costs are high and savings of 10 per cent can be achieved.