



**South African Oil Refiner Uses Lifecycle Estimating Solution to Deliver Consistent Capital Cost Estimates and Accelerate Project Execution**

“With an expanding project portfolio, we needed a formal and rigorous estimation function, to develop estimates in house and validate external originated estimates. AspenTech provided that.”

- Lentwe Matlhakoane, Project Estimator, SAPREF

# 5%

## bottom line cost reduction across projects

### CHALLENGE

SAPREF's key stakeholders were dissatisfied with a history of project overruns due to poor estimating. They looked to a new in-house estimation group to turn things around and deliver value quickly, creating new estimates and validating externally originated estimates.

The estimating function had significant resource limitations with only one estimator on staff, and no tools, systems or comprehensive historical data.

### SOLUTION

SAPREF selected Aspen Capital Cost Estimator™ (ACCE). Leveraging ACCE's cost database, volumetric estimation methodology and detailed reporting capabilities, SAPREF could prepare estimates in house, assure (validate) estimates prepared by EPCs, identify gaps and inconsistencies, and align reporting cost organization and costing with contractors.

Even with limited resources, the team implemented a fully fledged estimation function with reliable, predictable results.

### VALUE CREATED

- Established consistent project estimating practices (for internal and external resources)
- Aligned practices with EPC contractors, replacing their factoring approach with ACCE's volumetric modeling capabilities
- Updated Code of Account (CoA) allocation terminology for clarity and consistency (for Class 2 estimates)
- Completed an internal estimating guide ahead of schedule following newly aligned practices



## Introduction

SAPREF, a joint venture between Royal Dutch Shell Plc and BP Plc, is the largest crude oil refinery in South Africa. They have nearly 35% of the country's total refining capacity, processing 24,000 tons (approximately 176K barrels) of crude per day.

Prior to August 2017, SAPREF had been outsourcing all capital cost estimating work to external contractors since they had no internal team. After that date, as regulatory compliance projects and improvements for product specs were added to the estimating function's responsibilities, the company added in-house estimating resources while establishing more stringent guidelines and methodologies for contractors.

### **The estimating team had two primary goals:**

1. Validate (assure) estimates generated by external contractors in order to continue working with them on future projects.
2. Create a fully fledged methodology to handle rigorous estimates in-house, incorporating the estimation function into their project

workflow. Doing so would help them create estimates much earlier in the process so price could impact concept selection. This new estimate "template" could also be turned over to EPCs to make it easier for them to do their own estimates.

### **With these goals in mind, SAPREF's estimation group was faced with several key challenges:**

- Lack of personnel, as there was only one estimator working on this project at the initial phase.
- Lack of established guidelines, methods, standards and tools/programs to reach these goals.
- Disorganized historical data, making it very challenging to access or use the data.
- An increasing volume of work.

# Choosing the Right Estimating Solution

SAPREF chose to implement ACCE. The internal estimator quickly learned the program and best practices. He initially used the “out-of-the-box” ACCE, which has sophisticated cost and economic models built in, and later calibrated the software to customize it for the company’s projects.

The external contractor was accustomed to using factor-based estimating, which is very inaccurate and lacks details. SAPREF worked with ACCE’s volumetric estimation capabilities to validate the estimates generated by EPCs.

## **Comparisons between contractor factor-based estimates done previously and those done using ACCE revealed the following:**

- The factors used by external contractors to estimate bulk prices were significantly large, resulting in an artificially inflated Total Installed Cost (TIC) value.
- The methodology used by EPCs to estimate installation man hours was incorrect. They had scaled installation hours based on the material price rather than addressing the specific scope, equipment type, size and craft field productivity. For example, a clad vessel (317L) estimated by the EPC, resulted in 2.3 times more hours compared with a vessel of the same dimensions and conditions using unclad Carbon Steel. The number of hours to install the vessel should be very similar and not dependent on the material price difference between Carbon Steel and Stainless Steel. Because the contractor did not adhere to AACE International standards, subtotals and ratios dependent on those subtotals did not reflect the actual estimate.

The findings above were obtained by directly implementing ACCE’s default (OOTB) methodology, which does not rely on factors, but rather a volumetric approach that enables estimators to calculate bulk quantities needed for the project.



**Additionally, ACCE provided these three benefits:**

1. Enabled the owner to validate the accuracy of the factors used by the external contractor
  2. Helped provide evidence of the nonexistent dependency between material cost and installation hours (instead, they should be calculated based on equipment type and size)
  3. Provided an accurate COA arrangement out of the box, which was directly used by the estimator to comply with AACEI standards, making it easy to track costs across the full project.
- For two individual projects evaluated during this stage, TIC savings of 14% and 5% were achieved.
  - ACCE provided demonstrable guidelines in CoA allocation and estimate quality, which were followed in creating the internal guide.
  - The Assurance guidelines made SAPREF's expectations clear to the EPCs and created alignment throughout the organization.

## Summary

**SAPREF was able to establish clear and consistent practices to be followed when working with EPC contractors.**

- ACCE's successful implementation results were validated with practical results in the field.
- A 5% bottom line cost reduction was seen across projects due to improved practices.

ACCE enabled SAPREF to establish its Owner-EPC QA program, with tangible value along the way. The estimating guide was endorsed by Shell in the Netherlands (part owner of SAPREF) in December 2020 and will help the company develop further estimates.

In addition, SAPREF now has a clear system for prepping and evaluating estimates, resulting in a reduction of 5% on average of bottom line capital total installed project costs.





### **About Aspen Technology**

Aspen Technology (AspenTech) is a global leader in asset optimization software. Its solutions address complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with artificial intelligence. Its purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets safer, greener, longer and faster.

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