




### Business Impact

"Predictive analytics provides new insights that are missed if relying on human intuition alone. By using all the data available, predictive models can forecast issues in the gas sweetening process and reduce OPEX."

Rayan Hafiz  
Decision Support Engineer, Saudi Aramco



### Challenges

- **Ineffective performance management.** Traditional methods lacking direct sensor measurements are insufficient for the complex amine gas treatment process.
- **Incomplete knowledge.** Without a robust, high-quality data set, it's difficult to achieve reliable analytical results.
- **Unwieldy data.** Many organizations struggle to quickly access, integrate and cleanse diverse, big or unstructured data.
- **Prescriptive stability.** Moving from deterministic to prescriptive management of the gas sweetening process to optimize and stabilize outcomes is challenging.

## Optimize Amine Gas Treatment With Advanced Analytics

### The Issue

Amine gas treatment (also called gas sweetening) is a key process in the refining industry. The main objective is to remove hydrogen sulfide, carbonyl sulfide and carbon dioxide from the sour hydrocarbon gas streams. Amine is the (chemical) agent used to remove these components from the gas. The chemical is expensive, but it's required to prevent foaming and flooding during the refining process. Getting the mixture just right is no easy task for refiners, but is crucial to balancing the cost of operations (OPEX).

Refiners feel revenue impacts of poor amine gas treatment processes in two ways:

- **Reduced product quality**, which lowers product value and in some cases leads to fines.
- **Work stoppages**, which have to be done to correct problems in the treatment process. The cost of lost production is high - particularly since refinery margins are already thin.

### Our Approach

SAS helps operators improve process reliability while optimizing the cost of operations and maintenance. SAS delivers software and services to help you:

- **Reduce risk and mitigate unplanned downtime.** SAS analyzes sensor data for process improvement and provides early indicators of failure, such as foaming or flooding issues that destabilize the cleansing process.
- **Get more reliable analytical results** with an exploratory data analysis framework that offers an intuitive feel for the data; removes complexity prior to building models; and simplifies report creation and sharing.
- **Make faster, better decisions.** With SAS, you can quickly create reports, relying on data that's already prepared for analytics.

SAS helps refiners tackle the elusive and expensive challenge of optimizing amine gas treatment.

## The SAS® Difference: Earlier detection, reduced risks and lower costs

Robust data analytics provides reliable and repeatable models to address major business issues in refineries. With SAS, you get:

- **Predictive analytics to show what will happen**, and intuitive data exploration tools to help identify trends and overlay events. Techniques include Pareto event analysis, correlation analysis and variable reduction. Root cause analysis shows why an event occurred and identifies association rules to predict future events or faults. Stability monitoring shows the current state and alerts you of potential problems.
- **A high-performance visual analytics platform** that helps identify hidden patterns and relationships in multivariate, multidimensional, multivariate and stochastic data sets. A suite of graphs/plots simplifies model building. In turn, you can identify key independent variables that statistically influence dependent variables.
- **An enterprise data management layer** with a suite of advanced data quality control and governance protocols that evolve into a master data management platform. SAS offers a native connectivity to OSIsoft PI historian data for rapid data collection with read/write capability to prepare and populate data tables for subsequent modeling.

SAS develops predictive models to show what will happen and prescribes optimum parameters to enable what you want to happen.

## Case Study: Saudi Aramco

### Situation

Saudi Aramco has used SAS for nearly a decade. To tackle the challenge of amine gas treatment, the refiner took advantage of SAS software's connectivity to the OSIsoft PI System. It knew lost production costs could be up to \$400,000 per incident while waiting for the process to be diagnosed and repaired. The chemical (amine) is also expensive, but is required to prevent foaming during the refining process. It's too costly to use high amounts of amine; but if the process doesn't remove all contaminants, it can affect the quality of the next process in the supply chain and eventually lead to an out-of-spec final product.

### Solution

Saudi Aramco identified the leading indicators of failure. A root-cause analysis identified tags taken from the OSIsoft PI data historian that had the most statistical influence on the objective function: precluding foaming and flooding, and optimizing amine volume. Data patterns associated with process failure were modeled via correlation and principal component analysis.

### Results

Applying advanced analytics to the amine gas treatment process resulted in:

- Lower operational cost for the amine treatment process.
- Early warnings of foaming and flooding.
- Improved process reliability and less unplanned downtime.
- Earlier detection of issues, mitigating risk of failure or outage.
- Reduced incidental risk from unwanted impurities.

### What if you could ...

#### Improve results while reducing risk

What if you could use existing data to maximize hydrocarbon sweetness and minimize inherent risks?

#### Simplify and strengthen model building

What if you could reduce input space dimensionality but retain distribution variance and create better data sets for building models?

#### Manage data to garner its maximum value

What if you could break down silos to see a single version of the truth across all your data?

#### Predict problems in advance

What if you could predict foaming and flooding events and adjust the use of amine to reduce downtime?

You can. SAS gives you THE POWER TO KNOW®.

### SAS Facts

- SAS helps customers at more than 70,000 sites improve performance and deliver value by making better decisions faster.
- Nine of the 10 largest oil companies in the world rely on SAS Analytics.
- SAS is a Leader in the Gartner *Magic Quadrant for Advanced Analytics Platforms*, Q1 2014. [bit.ly/14T3Bwe](http://bit.ly/14T3Bwe)

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