



CLEANER AIR FOR EVERYONE

OPTIMISING CHEMICAL PROCESSES TO REDUCE EMISSIONS

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Highly efficient processes assist us in our everyday lives from the synthesis of fuels to the logistics behind warehousing and transport. For instance, you can get in your car and without thinking, turn it on and drive to the shops to pick up your groceries from the supermarket down the road. Little does one consider how much work has just happened behind that scene. First off, the fuel of the car has been meticulously blended with the correct proportions of varying length hydrocarbons to meet very specific criteria. The engine and components allow the vehicle to operate using incredibly tight tolerances. Furthermore, one is guaranteed that the supermarket will house the items they know and love because of the endless hours of optimisation via industry leaders. The same mentality is applied to chemical and processing plants whereby the methods developed for production produce as little waste as possible for the largest amount of product. Sometimes the waste streams cannot be reused thus are released as emissions which can either take the form as materials (solids, liquids, and gases) or radiation (light, UV, radio waves, microwaves, X-rays, gamma rays, etc.).

SAIYL prides itself in optimising chemical processes to reduce emissions, not only to meet government regulations but to protect plant personnel, surrounding communities, and ecosystems. One such project was recently completed where a chemical process was emitting large quantities of a volatile compound. The immediate solution was to include additional infrastructure to clean the outgoing gas stream however, this solution only solves the symptoms and not the underlying problems.

We suggested the following approach for root cause analysis:

Initial Site Visits & Process Overview

A team of Process Engineers would be sent out to the site to meet with the Client and discuss the issues at hand. The process conditions would be inspected, and plant personnel would be consulted as to the operating procedures. This initial inspection provides a framework with which the engineering team at SAIYL can use to provide a timely and accurate solution.

Literature Review & SME Consultation

Before one can approach how the process should be changed, you must review the literature relating to the process at hand. Furthermore, SAIYL has a close relationship with subject matter experts (SMEs) which means our engineers have access to various experts in the field and thus a wealth of knowledge is available at our fingertips.

Site Visits & Methodology Review

Following the literature review and SME consultation, our engineers will be able to visit the site and confirm changes in both the processing conditions and process methodology. If need be, the process can be modelled to provide additional points for optimisation. However, sometimes modelling cannot be performed due to the complexities of the reaction procedures and can more efficiently be done using laboratory-scale trials.

Computer Modelling & Laboratory-Scale Trials

SAIYL has access to a whole host of computer-based modelling applications that can assist our engineers and quantity surveyors with piping, process conditions, costing and optimisation. These can prove very useful in both emission analysis and abatement solutions. Furthermore, it is much easier to confirm results digitally before full-scale trials are needed.

We also provide the knowledge and expertise to perform laboratory trials before attempting the larger plant-scale trials. Like modelling, this solution will provide data for processes and operating conditions whereby alteration can take place on a smaller scale adding a layer of safety to process optimisation. Laboratory work also ensures faster turnaround with results and adaptations as glassware is easier to interchange compared to the fixed piping in a chemical plant.

Proposed Solution & HAZOP

The proposed solution could be a combination of methodology and processing conditions. These changes should be safely implemented through the use hazard and operability study (HAZOP) which guarantees that the new process will not undermine the health of the plant but more importantly its personnel. The Client at this point will be able to give the go-ahead to perform the methodology and/or the process modifications.

Plant Modifications

If the emission abatement solution requires plant modifications, SAIYL is prepared to perform these changes with our in-house construction, fitting, and turning team. The integration of all the departments allows for a very fast turnaround and minimises the risk of miscommunication and misunderstanding.

Plant-Scale Trials & Testing

Once all the preparation for the emissions abatement solution has been laid out and appropriate construction work has taken place, the plant scale trials can take place. A commonly used technique for emissions analysis is isokinetic stack monitoring – it is a method employed to determine the emission concentrations in a specific stream.

Close-Out

Once the emissions have been reduced and the client is satisfied with the results, SAIYL can provide the framework moving forward through reports and additional consultation.

After following through with these 7 steps, SAIYL was able to reduce the emissions from the processing plant to such low levels that the current outgoing stream treatment was redundant saving the client both operational capital and removed the need for the CAPEX required for additional gas cleaning equipment.