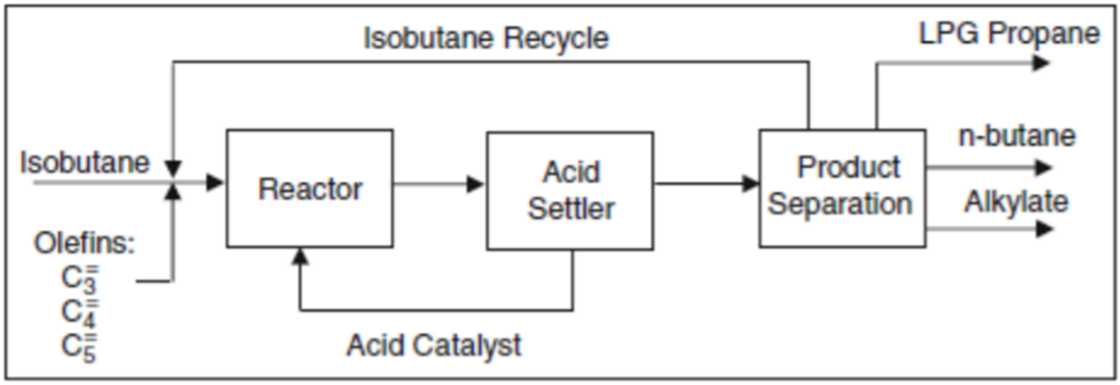
FLUORIDE MEASUREMENT IN PETROCHEMICAL INDUSTRY

Alkylation process

One of the processes developed in some refineries is the alkylation process. That process consists of a chemical synthesis in which small-chain olefins (mainly propylene and butene) are joined with isobutane (from the LPG fraction recovered in the atmospheric distillation of petroleum). The product of such synthesis is known as alkylate or alkylated gasoline.
The aim is to produce a fraction whose technical (high octane) and environmental (low vapour pressure and photochemical reactivity) characteristics make it one of the most important components of reformulated gasoline nowadays. In other words, the main objective of the alkylation process is to produce a high quality gasoline from olefins, mainly butylene, as it is the olefin that generates the highest quality in the final product.
The flow chart would be similar to the following:



As can be seen in the diagram, an acid catalyst is required for the reaction process carried out in the reactor, with hydrofluoric acid (HF) being the most commonly used due to its characteristics.

Need to measure fluoride in water

Hydrofluoric acid (HF) is a very strong acid, which is highly corrosive and can cause serious harm to people, such as burns or ulcers. In refineries, the alkylation area is usually more protected than other areas of the plant, indicating the degree of danger.
On the other hand, due to the low temperatures (around 30 °C) at which the reaction is carried out when HF is used as a catalyst, the coolant commonly used is water.

One of the ways to monitor the alkylation zone and to be aware when a leak has occurred in the hydrofluoric acid circuit is by measuring the fluoride in the cooling system water. In the event of a small leak in the circuit, the hydrofluoric acid would be diluted in the cooling water, thus increasing its concentration in the cooling water. In the event of such an incident, the plant would have to act quickly and consistently to solve the problem without creating any damage. To detect at the beginning steps an **increase of fluoride in cooling water permits to** avoid quickly air leaks, which will force the evacuation of the entire plant, which could result in losses of millions of dollars.

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The Instran online fluoride analyser is one of the leading automatic analysers for measuring fluoride in water. Its characteristics in the dosing of the reagents, which allow precise dosing of 0.015ml, the selection of highly resistant materials for the manufacture of the mechanical components, such as Kalrez®, the measurement technique, which allows elimination of interferences in the sample or changes in its matrix and the good functioning of the electrode make the Instran Fluoride analyser unique in the market. Furthermore, the low consumption of reagents and the low maintenance required for its activity make it a very economically competitive device. For more specific details on the Fluoride Instran online, please request the Fluoride Instran in water brochure.

Implementations

In November 2021, the petrochemical company *British Petroleum* (BP) decided to replace one of its existing *Tytronics* online fluoride analysers with the Instran Fluoride analyser for the Castellón refinery. Due to economic reasons (both in the price of the analyser and the variable cost of consumables and reagents) and equipment performance, the British company's management at the plant decided to go with the Instran analyser. Since its installation in January 2022, the equipment has been operating continuously and under intense monitoring by the plant's technical maintenance team to verify its correct operation, responding satisfactorily to the needs of the equipment.

In addition, due to specific demands from the refinery's employees, the cleanings performed by the equipment were modified to adjust the water consumption to the characteristics of the sample without affecting the fluoride measurements, thus showing the versatility of the equipment and the Instrumentación Analítica's engineers capacity to adapt to the customer's requests without affecting the correct activity of the analyser.

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