Drying liquid hydrocarbons efficiently

Quadrimex Chemical, a major player in chemical products supply and manufacture, has secured a patent for the design of its liquid hydrocarbons dryer. Benoit Padoan, process engineer at Quadrimex, discusses what sets the dryer apart from other methods.

IN REFINERIES, BEFORE hydrocarbons such as diesel arrive in storage tanks, it is often necessary to dry them to ensure the correct water concentration specifications and/or production appearance (for example, a clear and bright property). There are a number of drying technologies on the market, including coalescers, rock salt dryers, vacuum dryers or deliquescent dryers.

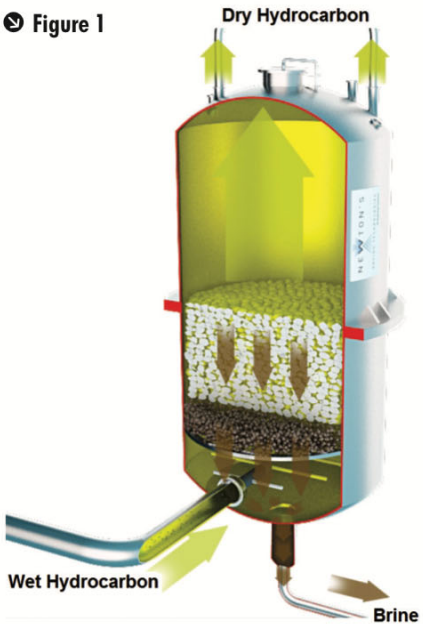
Coalescers separate emulsions into their components via various processes, while rock salt dryers have been used for many years to dry distillate and cracked product streams. But neither solution is efficient at removing soluble water; the major limitation of rock salt is that it will only remove insoluble or free-water haze from these process streams – and vacuum dryers are very expensive, both to buy and to run, in comparison with other technologies.

Instead, some refiners choose to buy a drying technology using deliquescent and dehydrating briquettes. Quadrimex Chemical's dryer technology (brand-name Newton) – enables refiners to reach a finished product using 80 parts per million by weight (ppmW) with a low initial investment and low running costs.

While the dryers have been used for the last decade, the French technology was patented in October last year. The patent incorporates the specific design of the dryers, with a focus on the 'inert layer bed', which works as a pre-drying system before the hydrocarbons come into contact with the briquettes in the dryer.

The technology is based on the capacity of desiccant and the deliquescent bed of the dryer to trap free and soluble water from the inlet hydrocarbons. The briquettes used vary according to the hydrocarbon treated and

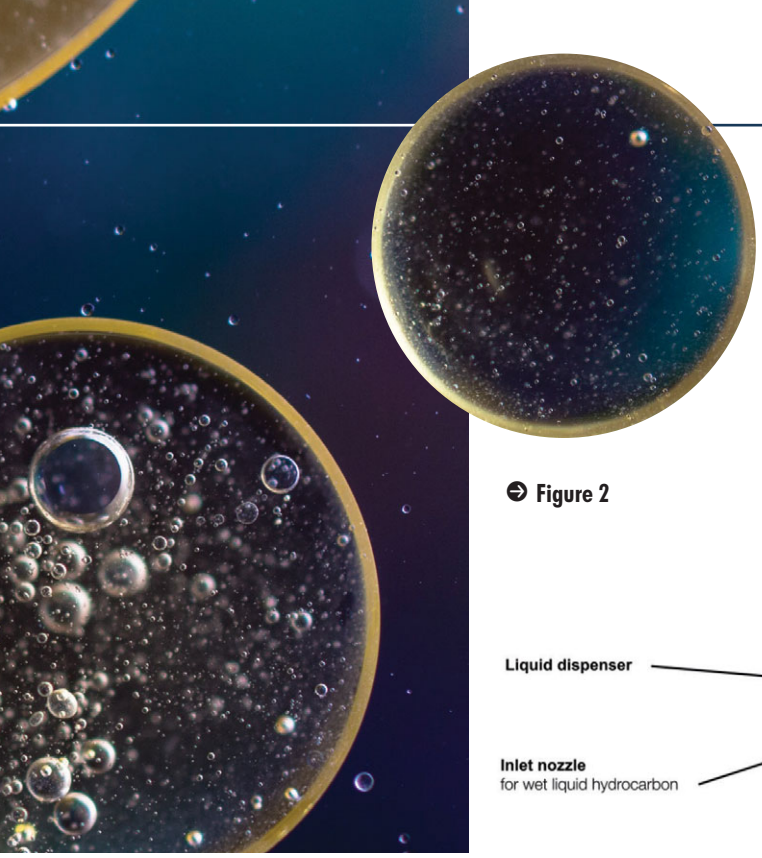
Figure 1



are based on either caustic soda NaOH (water trap NA), calcium chloride $CaCl_2$ (water trap Ca) or caustic potash KOH (K-TRAP).

The choice of the briquette type depends on the hydrocarbon and the unit that will be treated. Water trap NA briquettes dry kerosene, butadiene, xylene or vinyl chloride monomer (VCM); water trap Ca briquettes dry LPG, kerosene and diesel; while water trap K briquettes dry liquid petroleum gas (LPG) and alkylation products.

Figure 1 shows an internal schematic view of a dryer using deliquescent briquettes. It comprises several parts,



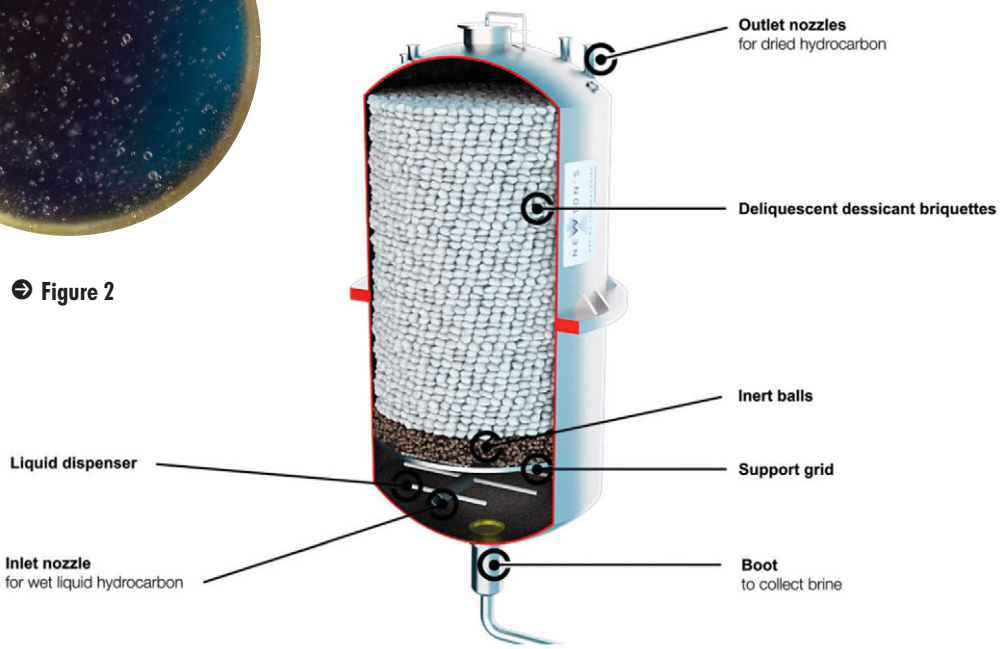


Figure 2

‘The refinery managed to increase the flow rate by 20%’

including an appendix (boot) to collect the brine, a distributor to homogeneously spread the hydrocarbons, an inert balls layer for pre-drying and a briquettes bed for hydrocarbon dehydration.

Other advantages of the system include its low operating costs, controlled water specifications throughout the process, enhanced productivity, less dust (no clogging) and no loss of dehydrating agents, which results in less waste.

Maintaining desired properties

One customer in Singapore faced two major challenges: increasing the flow rate up to 200m^3/hour of the diesel unit while maintaining the ‘clear and bright’ quality of the final product. To deal with these challenges, Quadrimex’s engineering division designed a new $CaCl_2$ diesel drying unit tailor-made for the customer. The dryer was implemented between the existing vacuum dryer, which was not powerful enough, and the diesel storage tank.

The refinery managed to increase the flow rate by 20% and to obtain the 80ppm water specification of the hydrocarbon at the end of the process, producing a product that met the requirements of the customer and the market.

The initial load was 110 tonnes of specific water trap Ca briquettes manufactured in France. According to the engineers, the dehydrating bed should be replaced every four months, on average. After two months, good results were seen (see *Figure 2*) despite unpredictable inlet hydrocarbon water content.

In this case, the liquid hydrocarbon flows through the fixed bed of the vessel in an upward flow direction. The inlet hydrocarbon, containing free and soluble water, enters at the bottom, through the dispenser’s holes. The fluid then emerges towards the inert balls layer (pre-hydration) and the briquettes bed (dehydration) where brine is generated. The brine is the result of the reaction between briquettes and water.

Dried hydrocarbon leaves the dryer by the top, whereas the brine goes down by density and enhances the solvent dehydration by further extraction in counter-current flow.

The briquettes bed is progressively consumed during the drying operation and further reloads are necessary to restore its initial performance. Loading is easy and lasts no more than a day and re-loading is not necessary for several months.

The dryer has given great results in many countries where Quadrimex Chemical has established the technology and the briquettes (water traps). They are available across the European, Asian, North and South American and Middle East regions. ●

CONTACT
Benoit Padoan
Process Engineer
Quadrimex Chemical

oil&gas@quadrimex.com
+33 490 787050