Crude Blending Price Differentials On-Line Analysis and Optimization

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The extreme fluctuations between high and low oil prices since the beginning of the 21st century, the ever changing geopolitical situation in the oil producing countries and oil producing countries, and the changing global demand for different fuels prevent refineries being depended on certain types of crude oils only.
To be competitive, today's refinery policy must be based in maximizing the refining margin, which is achieved my maximizing volumes of highly demanded fuels, at minimized the cost of crude oil.

Each type of crude oil provide limited ranges of products according to its distillation profile and its specification. Its price differentials depend on its quality properties, such as density, viscosity, hydrogen sulphide, salt and sulphur content, TAN content, naphthenic, and heavy metal content, which dictate the process ability and required post treatment of distillates. The utilization of opportunity crudes is in general limited by enhanced corrosion properties, fouling tendencies, and cost of processing.

Crude oil blending forms a keystone in increasing the refining margin, where crude oil blend are a composite of different crude oils, that will provide the required range and production capacity of fuels that are requested by the market, and by utilization of maximum quantities of low cost low quality crude oils and opportunity crudes. Although opportunity crudes are of relatively low cost

Blending of opportunity crude oils with conventional crude oils will result in the reduction of the negative influence of the API, Sulphur, TAN and Pour Point during the refining process. Blending of different crude oils with different curves form the platform in creating a blend with such a specification, that will increase the efficiency in maximizing the production volume and capacity of valuable distillates that are highly demanded by the market, or have high market values.

Although physical properties of a blend can be calculated by linear programming, only real time and on-line analytical data of the crude blend enables verification whether or not the requested blend is formed during continuous in line blending

process. On-line process analysers for measuring one or more critical parameters of the blend, as well as the crude oils to be blended for efficient on-line adjustment of the ratio between the different crude oil in the final blend. They also provide an effective tool in maximized utilization of opportunity crudes.

Several on-line process analytical technologies exist to measure on line physical properties, such as on-line vibrating element densitometer and different technologies to measure the viscosity. The TAN content is on-line determined by wet chemical titration technologies. The total sulphur content of crudes by on-line process XRF analyses, and the salt in crude analyser by an electrometric method based on conductivity.

In the absence of effective utilization of on-line process analysers and optimization software, the blender increases the risk to produce crude oil blends that upon distillation reduce the production capacity and yield of high valued products, increase the cost of post processing, such as desulfurization, and reduce the optimized incorporation of low cost opportunity crudes.