Tick-tock feedstock – time to drive profitability
Characterise and analyse crude assay data with breakthrough technology

The global refining and petrochemical industry has become more complex. With increasingly diverse crude sources, being able to easily evaluate and model the effects of crude feedstock selections is essential to achieving a competitive and cost advantage. The dynamics of the market have changed significantly in recent years. The world's crude sources and refining capacity continue to expand and shift geographically, which increase the crude purchase and petroleum products purchase decisions. Refinery closures and divestitures in some geographies such as the United States, Europe, Japan and Australia, create opportunities for the nimble organisations. Getting the right crude oil to the right refinery is vital to turning those opportunities into profits.

Analytics based on software models correctly calibrated for accuracy can provide real-time decision tools for the trader, engineer and refiner planner, confirming the end product can be delivered on time, at the quality expected and at maximum possible profit on a real-time basis to support business decisions. With competition increasing year on year, time is ticking for many refineries to protect margins and examine their processes, including feedstock selection, to extract every bit of profit possible from their operations.

The implementation of leading-edge software makes accurate and rigorous petroleum refining simulation widely accessible to more refining organisations with clear and simpler visualisation tools to understand model results. This helps industry leaders to make complex business decisions for the best possible use of their production operations and to more accurately forecast and understand the results. Isolated worlds of the refinery engineers, the planners, the scheduler and the traders, can now be closely tied together to achieve a level of collaboration with improved ability to optimise the entire refinery operation. Planning and scheduling models can be kept up to date and more accurate through simple and immediate access to results of engineering models tuned with current operating results, increasing the confidence that the plan will more closely mirror the actual production performance. This makes operational decisions more straightforward. Also, the ability to perform multi-unit engineering studies supports use and configuration of existing refining units for difficult and complex crudes, such as heavy and dirty oils. Overall, integrated process engineering software provides faster, more accurate and frequent analysis to achieve refinery profitability.

Moving from estimation to analysis and accuracy

A crude oil assay, the laboratory
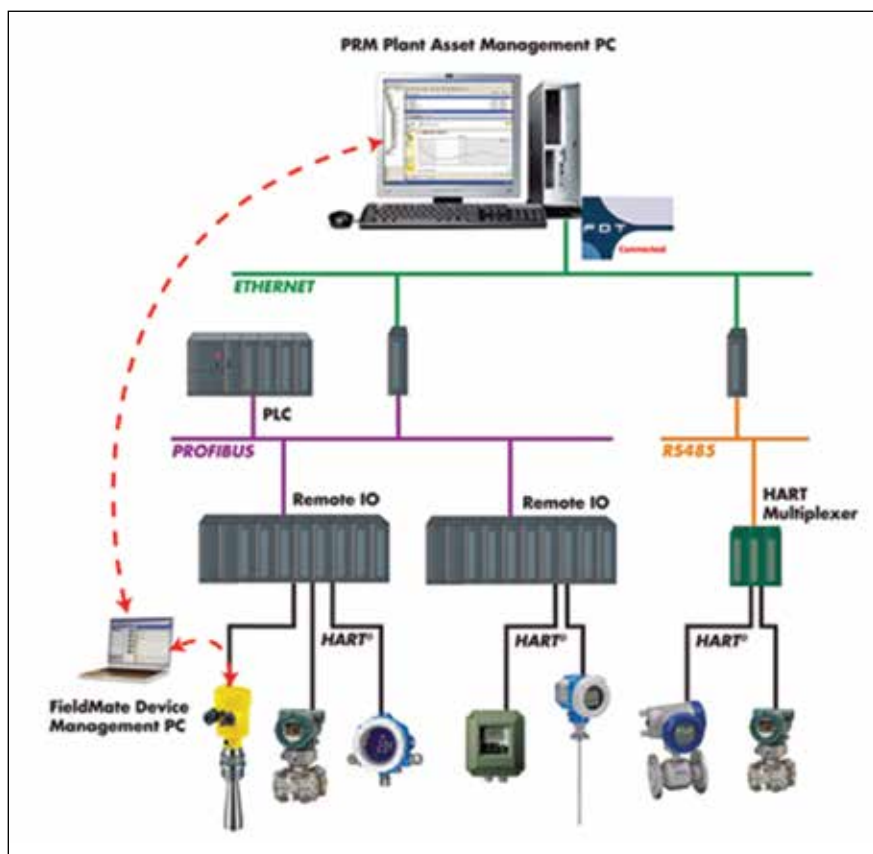
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profile of candidate crude properties, is the unique fingerprint and fundamental basis for understanding how a crude feedstock will perform in a refinery configuration. Assay data helps refinery engineers and planners determine for particular crudes (or more typical mix of crudes), whether that oil feedstock is compatible with a particular petroleum refinery train, or whether the new candidate crude itself might trigger issues reducing yield and quality or restricting product mix flexibility in that facility.

Refiners continually seek to speed up and improve feedstock purchase decision-making ability through using new techniques and technology to analyse their options rapidly when giving instructions to traders. While finished

PRM Plant Asset Management PC

in understanding how to best operate a refining or petrochemical facility to achieve best operations across the dimensions of flexibility, yield, quality and energy. Companies are increasingly employing engineering models, calibrated against current plant conditions, for tuning, decision-making, evaluating feedstock and product options. At the same time, planning software is being increasingly used to evaluate both crudes and petrochemical feedstocks faster. With these modelling tools in place, leading-edge producers have started to take advantage of the engineering models to more accurately and frequently update the planning models, increase planning validity and accuracy. Models are dependent on the accuracy of the hydrocarbon characterisations, so companies need powerful process engineering tools, which can characterise crudes, analyse multiple feedstocks, track petroleum properties and carbon emissions and leverage activated energy and economics for optimal operations and maximised profits. Advances in the ability to accurate characterise crudes from limited assay data is one of the most important areas of software innovation.

With today's cutting edge software, it is easy to update refinery planning and scheduling. Aspen HYSYS® Petroleum Refining (a leading engineering simulation system) includes tools to easily import and export petroleum assays to and from Aspen PIMS (the most widely used refinery planning system) with the new Aspen Assay Management. Companies can also automate the export of rigorous reactor models to Aspen PIMS (LP software). This support improves planning software accuracy leading to better and more profitable refinery feedstock selection.

Aspen HYSYS Petroleum Refining layers powerful features into the Aspen HYSYS process simulator to simplify

product demand is weak in some regions, crude costs remain high putting downward pressure on margins and if the crudes available for purchase are heavier, it presents processing and environmental challenges. As crude production declines in established producing areas like the North Sea, refiners are now forced to consider new sources discovered in the last few years to replace existing declining sources. Over time, most refiners must broaden their crude slates to lower average acquisition costs.

Today, the market is experiencing shifts in the composition of incoming crude, which creates challenges and opportunities for the industry. For Middle East petrochemical producers, strategic priorities are changing as regional feedstocks are increasingly consumed domestically, so creating added value products have become

a clear business strategy. As these organisations integrate their operations to move downstream in the value chain operational decisions become more complex against a backdrop of market uncertainty and shifting sources. Also, with the increased supply of shale gas and corresponding lower gas prices in North America, America's petrochemical producers are gaining a competitive advantage in the global market, shifting purchase and sale strategies. Companies across the globe are experiencing a new era of expanded feedstocks and commercialisation in the petrochemical market.

Automating Assay Management adds value

There are several key trends in application and use of software modelling tools in this new environment. First, rigorous engineering simulation models have become extremely important

Solve Refining Simulation Challenges More Easily.

Aspen HYSYS® Petroleum Refining layers powerful features onto the Aspen HYSYS® process simulator to simplify and improve petroleum refining simulations.
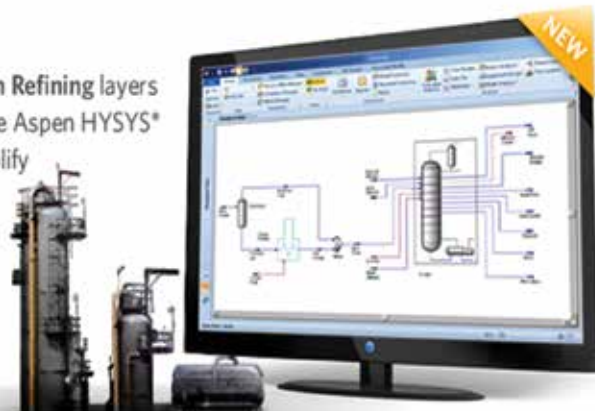
and improve petroleum refining simulations. Streams are driven with crude assays that support an extensive set of stream petroleum properties. Complex, multi-unit simulations can be quickly configured incorporating key conversion units, such as FCC and associated fractionation. Breakthrough innovations help refinery engineers optimise operations and support planning. Aspen Assay Management in Aspen HYSYS Petroleum Refining accurately characterises the petroleum feed, including heavy oils for feedstock selection and optimised operations. This new capability delivers the same assay management system that is available in Aspen PIMS to Aspen HYSYS Petroleum Refining.

By automating the import of crude data from Aspen Assay Management into Aspen HYSYS Petroleum Refining, users eliminate the manual process of entering hundreds of crude data points in order to accurately model a crude slate. In addition, Aspen HYSYS now features models for Visbreaker and Delayed Coker units required for processing heavy crudes. Now companies can easily evaluate and model the effects of crude feedstock selections in the refinery process with the Aspen assay management in Aspen HYSYS

Petroleum Refining. Access to hundreds of assays from a variety of regions in the assay library database for use in the simulation delivers enormous benefits.

Key benefits of using process engineering software tools:
☛ Better and faster crude feedstock selection through joint use of planning and engineering models
☛ Improved operations through more accurate scheduling models
☛ More powerful operability studies, based on accurately calibrated engineering models, to confirm the feasibility, safety and reliability of potential crude blends
☛ Improved unit profitability through engineering studies (e.g., cut point optimisation, catalyst selection, heat exchanger monitoring) that reduce energy use and regulated emissions
☛ Improved refinery margins through re-evaluation of feed routings in multi-unit configurations

Many companies see significant benefits with the adoption of process modelling software. Companies can increase profits with better feedstock selection, using consistent assay data across tools like Aspen HYSYS and

Aspen PIMS. Also, they can optimise the process for heavy crude handling, whereby the assay characterisation is now better for heavier, more complex crudes. For example, Saudi Aramco E&P increased throughput by 3-8%, reduced planning time by 50-70%, reduced inventory by 15-35% and made 3-5% energy savings by integrating Aspen HYSYS and Aspen PIMS across all major surface facilities. S-Oil has seen its energy loads reduce by over 100 MW per year, saving over $39 million. SABIC has also successfully employed the planning tools traditionally used in refining for its bulk chemical operations in the UK.

Time to drive profitability

Feedstock assay data are an important tool in the refining process. The clock is ticking regarding the attractiveness of certain feedstocks. Liquid feedstocks will be dependent on future oil prices and other routes to petrochemicals will be subject to scrutiny and assessed according to their technical and environmental safety and feasibility. Times are changing as shifting feedstock slate creates challenges and opportunities for the industry. Companies are faced with increased global economic challenges, dynamic market conditions and pressure to reduce time-to-market. By implementing cutting edge software, refining and petrochemicals companies will improve feedstock selection, so users can integrate crude assay libraries and links to LP planning tools for better crude selection, planning and scheduling of operations – all in an effort to maximise plant performance and business profitability. The enlightened organisation will be able to use these tools to make faster decisions, take advantage of both purchase and sale opportunities, reduce economic uncertainty and gain a competitive advantage.