Refining

Blending is the seventh unit in this seven-step overview of Refining

Overview of Blending Process

The major refinery products produced by the product blending process are gasoline, jet fuels, heating oils, and diesel fuels. The objective of product blending is to allocate the available blending components in such a way as to ensure all product demands and specifications are met at the least cost and to produce products which maximize overall profit.

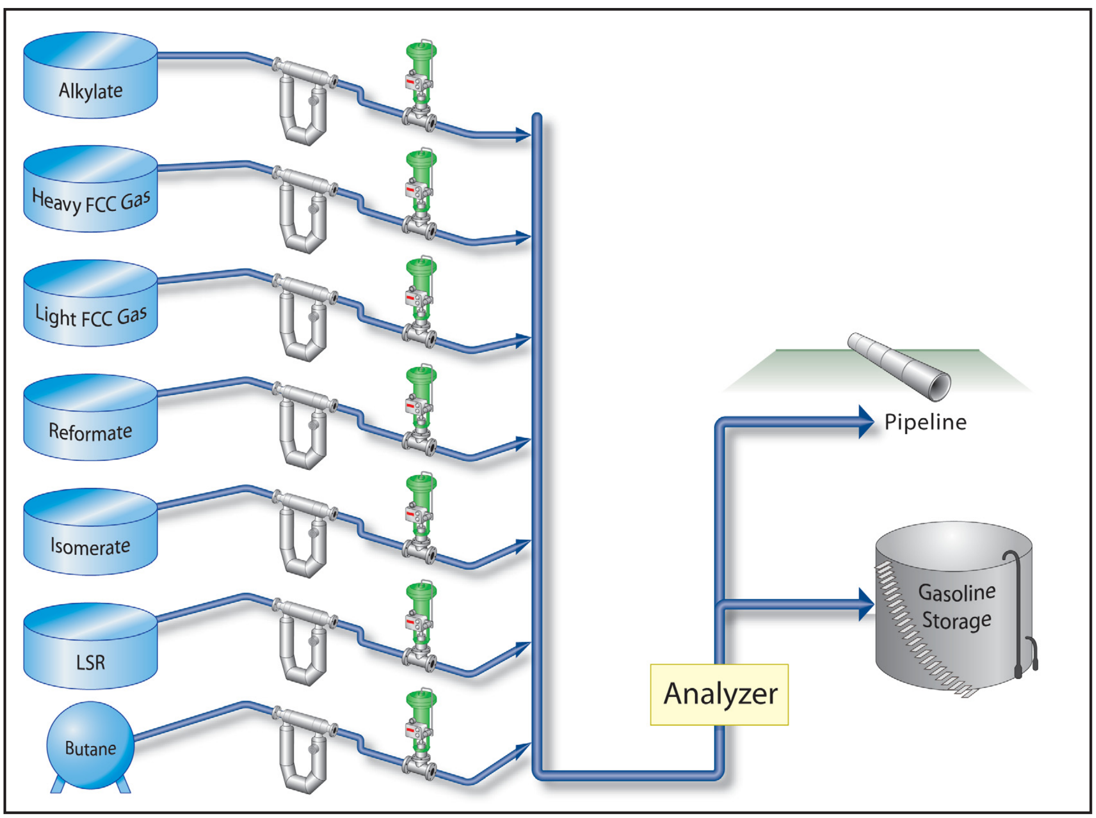
Gasoline blending is a refinery operation that blends different component streams into various grades of gasoline. Typical grades include 83 octane (blended later with an oxygenated fuel such as ethanol), regular 87 octane and premium 92 octane. The Ried Vapor Pressure (RVP) is set depending on the average temperature of the location the gasoline will be used (cold temperatures require higher RVP than warmer climates). These two specifications are the most significant and they are documented with each blend, to minimize the potential for octane giveaway.

If the octane specification is 87.0, each 0.1 octane over this target value costs the refiner money. In the United States, this cost calculates to approximately $1,000,000 per 0.1 octane giveaway per 100,000 bpd crude capacity.

The RVP is slightly different. Refiners aim to blend as much low value normal-butane (component RVP of 52. 0 psi) into the final blend without going over the specification. For example (note, these values change over time), the cost of n-butane is $7 per barrel that can be sold as gasoline at $25 per barrel just by blending. The $18 per barrel profit is significant to the refiner, making RVP economics important.

Distillate fuel blending has other specifications that must be met. Distillate blending includes jet fuels, diesel fuels, kerosene and No.1 and No.2 fuel oils. Diesel fuel properties that are measured include Cetane number (analogous to octane number for the gasoline engine); Flash point (relates to fire hazard in storage); Low temperature properties, including cloud point; and pour point Sulfur content.

In blending some products, such as residual fuel oils or asphalt, viscosity is one of the specifications that must be met.



Blending Process Diagram

The challenges to the Blending Process are detailed on the next page.

Customer Challenges

Most refiners use computer-controlled in-line blending for blending gasoline and distillates. Inventories of blending stocks, together with cost and physical property data are maintained in a database. Many of the properties of blend components are non-linear, such as octane number, so estimating final blend properties from the components can be quite complex. When a certain volume of given quality product is specified, the computer uses linear programming models (LP's) to optimize the blending operations to select the blending components to produce the required volume of the specified product at the lowest cost. Accurate measurement is required to match the optimized recipes for the products.

Customer Process Challenge #1 – Optimizing Blends for Gasoline and Diesel Fuel

Challenge: Inaccurate flow measurement can result in products that don't meet specification, so they need to be downgraded, or that require doctoring of the blend in the final tank which costs time and money. The target volumes for each of the components is not met because the turbine meters typically used for flow measurement lose their accuracy over time due to the non-lubricating nature of some of the products.

Customer Process Challenge #2 – Blending Asphalt at High Temperatures

Challenge: Asphalt from the refinery is often blended with a polymer to meet specifications. Asphalt blending takes place at elevated temperatures to keep the material from solidifying, and PD meters are typically used for the blending operation. Because of the severe service, maintenance cost reduction on the blender is the biggest challenge.

Improving Blending Efficiency

Recommended Product Solution

Customer Challenge #1 - Optimizing Blends

Control Point Challenge: Optimizing blends to lower costs by reducing octane or cetane giveaway and maximizing lower cost components such as butane in gasoline.

Solution: Micro Motion meters can be used to accurately measure all the gasoline or diesel fuel components. Accurate measurement means refiners can blend directly into the pipeline, eliminating requirements for storage tanks. If blending into a tank is desired, use of the Micro Motion meters results in reduced doctoring of the blends.

Competing Technology: Turbine meters

Micro Motion ELITE CMF300 and CMF400 and D600

Applications

- Gasoline blending components
- Diesel blending components
- Fuel oil blending components

Customer Challenge #2 - High Temperature Blending

Control Point Challenge: Eliminating maintenance problems for the high temperature flow meters of the asphalt blender.

Solution: Because of the non-intrusive nature of Coriolis meters, and the fact that they have no moving parts, they are an excellent choice for the measurement of heavy, viscous fluids. Micro Motion meters, designed to operate at temperatures up to 650 F, or 343 C, are ideally suited to measurement of asphalt streams.

Competing Technology: PD meters

Micro Motion ELITE High Temperature Meters CMF300A, CMF400A

Application

- High temperature asphalt

EMERSON
Process Management

