

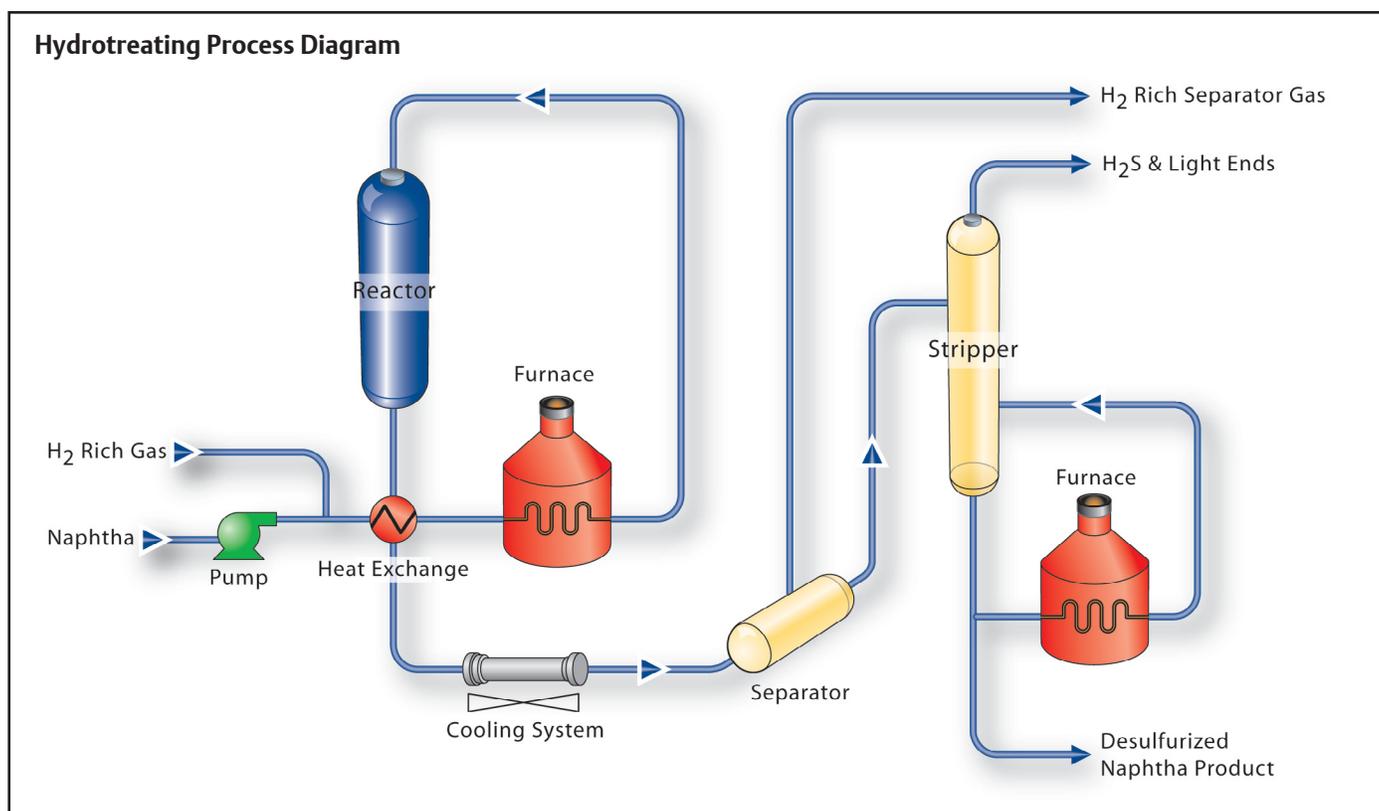
# Refining

Crude and Vacuum Distillation	Delayed Coker	Fluidized-bed Catalytic Cracker (FCC)	Alkylation	<b>Hydrotreating</b>	Hydrogen Plant	Blending
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**Hydrotreating** is the fifth unit in this seven-step overview of Refining

## Overview of Hydrotreating

Hydrotreating is a process to catalytically stabilize petroleum products and remove objectionable elements from products or feedstocks by reacting them with hydrogen. Stabilization usually involves converting unsaturated hydrocarbons such as olefins and gum-forming unstable diolefins to paraffins. Objectionable elements removed by hydrotreating include sulfur, nitrogen, oxygen, halides, and trace metals. Hydrotreating is applied to a wide range of feedstocks from naphtha to reduced crude. When the process is employed specifically for sulfur removal it is usually called hydrodesulfurization or HDS. To meet environmental objectives it also may be necessary to hydrogenate aromatic rings to reduce aromatic content by converting aromatics to paraffins.



## Customer Challenges

The hydrotreating process is currently a very important process because of the clean fuels regulations; however it is a very simple process, so the customer challenges are limited.

The process variables are usually set to run under certain conditions, and are not often manipulated to maximize performance or optimize operations. Probably the most important measurement on the unit in terms of flow measurement would be the hydrogen because the hydrogen balance is becoming increasingly important as sulfur removal is becoming more critical. The hydrogen stream flow needs to be combined with the hydrogen purity in order to perform the hydrogen balance.

Reducing energy costs associated with any furnace in a refinery is also always a challenge.

### Customer Process Challenge #1 – Hydrogen Balance around the Unit

**Challenge:** Getting an accurate measurement of the amount of hydrogen being consumed in the hydrotreating process is important to both the process and the overall hydrogen balance for the refinery. Hydrogen measurement with traditional orifice dP measurement is often very inaccurate, especially as the molecular weight of the hydrogen streams change with the varying hydrogen purity.

The hydrogen purity must still be measured independently for the H<sub>2</sub> balance, but the overall flow measurement is accurate, so that when multiplied by the purity, an accurate H<sub>2</sub> measurement can be made.

### Customer Process Challenge #2 – Improving Furnace Efficiency

**Challenge:** With changing compositions of the fuel gas or fuel gas/ natural gas supply, the energy to the hydrotreating furnace can fluctuate making it challenging to control the furnace efficiently. If the furnace uses a cascade control scheme of volumetric flow to temperature, and the composition of the fuel changes, a volumetric flow device will not see the change in the energy content, contributing to instability of the furnace.

Improving Hydrotreater Efficiency

Recommended Product Solution

Customer Challenge #1 - Hydrogen Balance around the Unit

**Control Point Challenge:** Getting an accurate account of how much hydrogen is consumed for the hydrogen balance, especially on streams with varying H<sub>2</sub> purity.

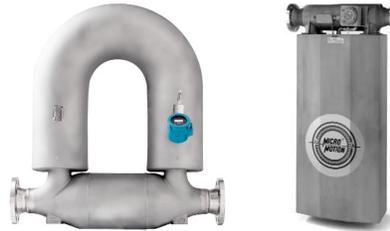
**Solution:** Measuring the hydrogen streams feeding the hydrotreater using Micro Motion will significantly improve the flow measurement because the measurement is independent from composition changes.

**Competing Technology:** Orifice dP

Micro Motion ELITE CMF400 and D600

**Application**

Fresh make-up hydrogen  
Hydrogen recycle gas



Customer Challenge #2 - Improving Furnace Efficiency

**Control Point Challenge:** Improving the efficiency of the hydrotreating furnace.

**Solution:** Controlling the mass rate of the fuel gas to the furnace will help to control the energy feeding the furnace, thereby stabilizing the furnace and improving the efficiency. Large changes in the fuel gas composition will no longer cause big temperature swings in the furnace.

**Competing Technology:** Orifice dP meters

Micro Motion ELITE CMF200, ELITE CMF300, F-Series F200 or F300

**Application**

Fuel gas to the furnace

