

# Acid gas feed analyzers in sulfur recovery

## PIR3502 Multiwave process photometer



Maximize the sulfur recovery efficiency and protect catalysts.

### Measurement made easy

PIR3502  
IR process photometer

### Industry Refining

#### Introduction

Refinery hydrocarbon streams contain sulfur compounds as impurities that can contaminate catalysts and cause operational problems. A hydrotreating process is used to convert any sulfur compounds present to hydrogen sulfide (H<sub>2</sub>S). The H<sub>2</sub>S from the hydrotreater is sent to a sulfur recovery plant to convert the hydrogen sulfide to elemental sulfur. Plants generally run by controlling the main air valve by flow and control the trim air valve with a tail gas analyzer that measures H<sub>2</sub>S and SO<sub>2</sub>. This does not work well when the composition of the feed gases change.

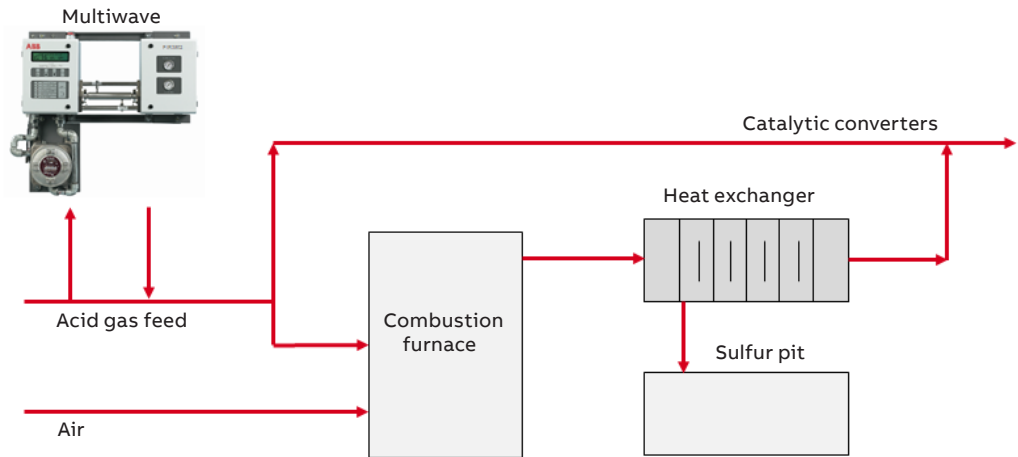
The measurement of the combustion air requirement for the acid and sour gas feeds to the combustion furnace, enables feed-forward control of the primary air valve.

The combustion air requirement changes as the H<sub>2</sub>S, ammonia and hydrocarbon concentrations fluctuate in the feed streams. A PIR3502 IR process photometer (Multiwave) can measure hydrogen sulfide, total hydrocarbons, water vapor and ammonia or carbon dioxide in acid and sour gas feed streams.

#### Benefits

- Careful control of the main airflow valve in the combustion furnace provides the following benefits:
- Maximize the sulfur recovery efficiency
  - Protect catalysts
  - Ensure that environmental regulations are achieved

The PIR3502 process photometer provides acid and sour gas feed streams reliable monitoring of the feed streams in refinery sulfur recovery plants

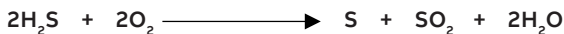


### The Analyzer

The ABB PIR3502 process photometer is a multiple channel, fixed wavelength photometer that can accommodate up to eight different optical filters. It ratios the energy from a measure wavelength filter (where the component of interest absorbs energy) to a reference wavelength filter (where none of the components absorbs energy). The acid and sour gas feed analyzers use optical filters in the infrared (IR) region of the electromagnetic spectrum. The acid and sour gas feed Multiwave photometer uses a heated cell set at approximately 120 °C (248 °F). The major benefit of this design is that the sample is kept hot to prevent water from condensing as well as preventing the ammonia and carbon dioxide from reacting to form solid carbamates. The Multiwave photometer has established an excellent reputation for reliable and stable performance in refinery applications:

### Discussion

Claus sulfur recovery plants typically use a two step, split stream process. The first step is controlled combustion of acid gas feed in a combustion furnace by the following reaction:



One-third of the acid gas is burned in the furnace; the other two-thirds of the acid gas is sent to the Claus catalytic converters. The fast response time of the PIR3502 process photometer allows for feedforward control of the main air control valve to the oxidation furnace.

There are two types of gas streams that are fed to the oxidation furnace. These streams are identified as acid gas and sour gas that contains ammonia. The sample handling system and sample cell are heated to ensure that the sample remains in the vapor phase.

The following components are typically measured with the PIR3502:

Component	Acid gas	Sour gas
H <sub>2</sub> S	0 to 100 %	0 to 50 %
NH <sub>3</sub>	—	0 to 50 %
CO <sub>2</sub>	0 to 50 %	—
H <sub>2</sub> O	0 to 5 %	0 to 50 %
Total Hydrocarbons	0 to 5 %	0 to 5 %

The ABB PIR3502 process photometer for acid and sour gas feed streams provide reliable monitoring of the feed streams in refinery sulfur recovery plants. Since the Multiwave measures all the compounds that require air for combustion, it enables feedforward control of the main airflow valve to the combustion furnace even with changing feedstocks. With the addition of the feed analyzers, it allows the tail gas analyzer to only be depended on for adjusting the trim air valve; and, also gives some control to the process when the tail gas analyzer is offline for maintenance.