

CNOOC INTERNATIONAL

Chemetics Spent Acid Treatment Technology

Relevant for Chemical Industry and Petroleum Industry



→ L-Com 5500, Version Hastelloy Ex-d.

Monitoring with Perfection: Concentration Measurement of H_2SO_4 in Spent Acid Regeneration Plants (SAR) with Anton Paar's Inline Sensor Portfolio

The heart of the world economy contains H_2SO_4

Sulfuric acid is one of the most produced base chemicals in the world. The acid is used in various industries and product steps, including the production of fertilizers and batteries. It's also used for the hydrometallurgical extraction of different ores and surface treatment of metals. And it is employed in many intermediate production steps in the food, pharma, or semi-conductor industry.

In fact, sulfuric acid plays such an important role in the global economy that its production and consumption are often used as an indicator of a country's growth rate and economic development.

In 2022, China manufactured around 100 million metric tons of H_2SO_4 , making it the biggest sulfuric acid player on the world market. In the coming years, increased demand for sulfuric acid will drive its production even more, and key industries such as the semiconductor and pharmaceutical industries will increasingly demand high-purity and – from a qualitative perspective – seamlessly monitored sulfuric acid.

Sound velocity and density: A perfect combination

The Worley Group is a key provider for innovative technologies for sulfuric acid production and spent acid treatment. Challenging processes such as the regeneration of spent H_2SO_4 (SAR) can be performed under economical and cost-efficient conditions using the Chemetics® spent acid treatment technology by Worley.



→ L-Sonic 5100, Version Hastelloy in action

“From experience, we saw that refractive index often led to inaccurate measurements, especially when the sulfuric acid reached a concentration close to or above 100 %. This caused unwanted economic issues and environmental pollution incidents in our plant.”

**Mr. Dai,
Director of Instrumentation
at China’s largest acrylonitrile
producer**

Producing 780,000 tons per year, China’s largest acrylonitrile producer relies on Anton Paar application know-how, decades of experience in the sulfuric acid industry as well as the optimized inline process sensor portfolio.

The company has three SAR plants on-site, using Worley’s Chemetics spent acid treatment technology.

The reasons for choosing Anton Paar as a strategic partner are for Mr. Dai, Director of Instrumentation, obvious: “Anton Paar can meet all required measurement ranges and measurement points with one process sensor portfolio using sound velocity and density and combined sound velocity-density meters.

Competitors recommend the use of refractive index as a principle method but this technology can only address a measurement range of 96 % to 100 %.

From experience, we saw that refractive index often leads to inaccurate measurements, especially when the sulfuric acid reached a concentration close to or above 100 %. This caused unwanted economic issues and environmental pollution in our plant because unconverted SO₃ was released to the atmosphere. As a consequence, we were searching for alternative measurement methods and found them in the inline process sensor portfolio of Anton Paar.

Anton Paar’s sound velocity (L-Sonic 5100) and density (L-Dens 7400) sensors as well as the unique sound velocity-density combined sensors (L-Com 5500) were added to each refractive index measurement point. It turned out that since installing the Anton Paar instruments, no pollution incident has happened. The refractive index sensors were replaced by sound and density sensors from Anton Paar. Due to the genius combination of sound velocity and density, no reversal points for 90 % to 110 % H₂SO₄ concentration range occur – this is the best possible combination for our SAR plants.”

“The refractive index sensors were replaced by sound and density sensors from Anton Paar.

Due to the genius combination of sound velocity and density, no reversal points for the whole 0 % to 110 % H₂SO₄ concentration range occur, which make it the best possible combination for our SAR plants.”

**Mr. Dai,
Director of Instrumentation
at China's largest acrylonitrile
producer**



→ L-Sonic 5100, Version Hastelloy Ex-d

Currently, Anton Paar has installed 35 inline process instruments for China's largest acrylonitrile producer:

- 13 pcs. L-Dens 7400 TAN (SAR 2 and 3)
- 15 pcs. L-Sonic 5100 HAS BC1 (SAR 2 and 3)
- 4 pcs. L-Com 5500 HAS (SAR 2 and 3)
- 1 pc. DPRn; 2 pcs. DSRn (SAR 1)

Technology Provider:

- SAR 2 and SAR 3- Worley (Chemetics®)
- SAR 1- Worley (Chemetics®)

A successful collaboration

The China National Offshore Company (CNOOC) operates a sulfuric acid regeneration (SAR) plant on-site with innovative and future-oriented Worley (Chemetics®) H₂OS₄ technology. Looking for a suitable partner offering in-line process sensors for concentration measurement, CNOOC came across Anton Paar.

Mr. Xiang, Director of Instrumentation at CNOOC, states that there are several reasons why CNOOC supports Anton Paar. “First of all, the Design Institute told CNOOC that Anton Paar is the best among all competing brands. Compared to others, Anton Paar can meet all inline measurement positions in the entire process package with its well-established process sensor portfolio. Also, the good cooperation between Anton Paar sales and CNOOC during the bidding period of the project showed to us that Anton Paar would be a reliable partner for a successful collaboration.”

Currently, 11 Anton Paar process instruments, which cover the entire sulfuric acid concentration range from 0 % to 110 %, are installed at the CNOOC SAR plant:

- 3 pcs. L-Dens 7400 TAN (0 % to 80 %)
- 6 pcs. L-Sonic 5100 HAS BC1 (80 % to 100 %)
- 2 pcs. L-Com 5500 HAS (90 % to 110 %)

Technology Provider:

- Worley (Chemetics®)

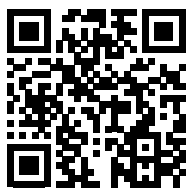


→ L-Com 5500, Version Hastelloy Ex-d.

“Anton Paar is the best
among all competing brands.”

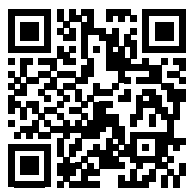
Mr. Xiang,
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Instruments L-Sonic 5100, L-Dens 7400, L-Com 5500

Measured parameters Concentration [%]

Samples Sulfuric acid (H₂SO₄)

Accuracy up to ±0.015 % (sound velocity), up to ±0.1 % (density), up to ±0.05 % (density/sound velocity combination)

Sample throughput 24/7