Panametrics

Application note

Moisture: a key parameter in Sustainable Aviation Fuel (SAF) process optimization

Application specifications:

- Typical Moisture range: 0 - 5 ppmV
- Typical Operating Pressure: 15- 50 barg

Benefits:

- **Precision Moisture Control:** High sensitivity and wide dew point range, ideal for applications in SAF production
- **Enhanced Process Safety & Quality:** Moisture in feed stocks or SAF intermediates can lead to corrosion, catalyst fouling and contribute to ice formation. Precise moisture measurement helps mitigate these risks. Aluminum oxide sensors are already used to prevent moisture related degradation in aerospace fuel systems, reinforcing applicability to SAF.
- **Integration and Compliance:** A single packaged analyzer system solution, traceable calibration, digital communication are ideal for aviation industry requirements.

Overview

Sustainable Aviation Fuel (SAF) is gaining global traction as a critical solution to reduce carbon emissions in the aviation sector. SAF can be produced from various feedstocks via different conversion technologies. One technology is Alcohol-to-Jet Fuel (ATJ) which converts alcohols like ethanol or isobutanol into hydrocarbon jet fuel. ATJ involves multiple catalytic steps that are sensitive to moisture. Accurate and reliable moisture measurement is therefore essential to maintain catalyst activity, protect equipment, and ensure product quality.

Application

In the ATJ process, ethylene or other light hydrocarbons are intermediates during the dehydration, oligomerization, and hydroprocessing steps. Moisture must be tightly controlled in:

- Feed gas purification
- Dehydration reactors
- Oligomerization or hydrocracking units
- Final fuel refining or blending stages

Excessive moisture (greater than 1 ppm) in ethylene production processes can lead to catalyst deactivation, corrosion in high-pressure systems, trigger premature reactions, and reduce overall yield and product quality.

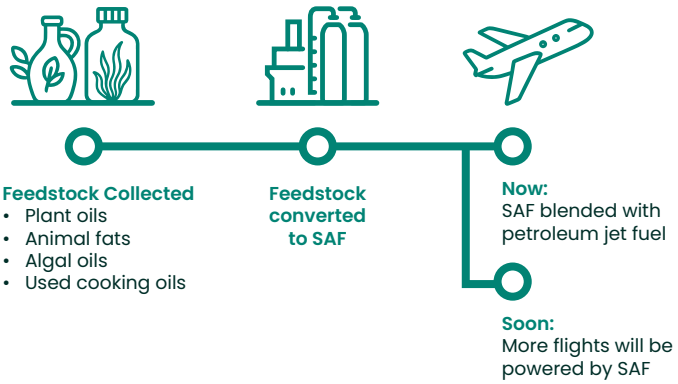
To maintain moisture levels below the alarm threshold (<1 ppm), molecular sieve dryers are required to remove moisture from the process gas feeds. It's essential to measure moisture downstream of the process outlet.

Challenge

The SAF production environment presents the following measurement challenges:

- **Low Moisture Concentrations:** Measurement is often required at ppm or sub-ppm levels.
- **High Pressure/Temperature:** Process streams can operate at pressures 15- 50 barg and temperatures >100°C.
- **Process Contaminants:** Risk of fouling or contamination due to residual catalyst, particulates, or condensables.

Accurate moisture measurement in such demanding environments requires a robust, sensitive, and reliable analyzer system.



Solution

Panametrics' HygroPro II and HygroPro XP aluminum oxide-based moisture transmitters are ideally suited for moisture measurement in SAF production processes due to the following capabilities:

- **Measurement Range:** Detects from ambient to sub-ppm moisture levels.
- **Sensitivity:** Ensures tight process control.
- **Fast Response Time:** Real-time monitoring of moisture changes for proactive control.
- **Area Classification:** Certified for hazardous areas.
- **Rugged Construction:** IP66/IP67 rated for harsh industrial environments.
- **Versatile Output:** 4–20 mA analog + HART protocol for seamless integration with control systems.
- **Sampling Systems:** Packaged solution like pro.IQ or a custom solution to meet application needs for a turnkey solution.

By integrating HygroPro II or HygroPro XP into key points in the SAF process, such as after dehydration reactors or before final blending, operators can prevent costly moisture-related issues and ensure compliance with aviation fuel quality standards (e.g., ASTM D7566)

HygroPro II

HygroPro XP

Panametrics, a Baker Hughes business, provides solutions in the toughest applications and environments for moisture, oxygen, liquid and gas flow measurement.

Experts in flare management, Panametrics technology also reduces flare emissions and optimizes performance.

With a reach that extends across the globe, Panametrics' critical measurement solutions and flare emissions management are enabling customers to drive efficiency and achieve carbon reduction targets across critical industries including: Oil & Gas; Energy; Healthcare; Water and Wastewater; Chemical Processing; Food & Beverage and many others.

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