Safety technology from MBA Instruments for TransTank: Continuous conductivity measurement in Jet A-1 – a success story in pS/m-dimension

In many tank farms light oils are refined, stored and handled. Specialised in handling aviation fuel Jet A-1 they know all details of safety regulations. The company TransTank GmbH operates tank farms of BP Europa SE at 5 locations in Germany. With a capacity of 311,000 m³ the tank farm in Mainz-Gustavsburg is the main supplier of the Frankfurt airport regarding kerosene Jet A-1. Since many years TransTank relies on the reliable devices of the Quickborn based company MBA Instruments GmbH. The result of such excellent collaboration of both companies is an important improvement for the conductivity measurement technology which sets new standards in the matter of safety.

The task
The conductivity of kerosene, which is been supplied from Rotterdam via a 650 km pipeline, has so far been verified by point measurements with the hand-held instrument MLA900. Depending on the measurement result an amount of Static Dissipator Additive (SDA) was dosed and raised the conductivity to the required safety level. Within the framework of an improvement program of the operations the head of the tank farm Klaus Krupka engaged himself also in the safety parameter conductivity. His conclusion: "With a continuous conductivity measurement system according to the measurement method described in ASTM D2624, we would achieve a significant improvement of our working processes." What was triggered by this short comment is a success story in the industrial metrology, especially in the scale of "Pico-Siemens per meter".

The solution
Very often complicated things are born by the power of simplicity. The measurement of electrical conductivity is based on the conductometric principle. A low DC voltage is applied between the electrodes. With the measured current the determination of conductivity is possible. The measuring range of conductivity in aviation fuel is extremely low with 0-2000 pS/m (S = Siemens as the inverse of the resistance). For the development of the continuous version of this measurement method some different physical details in the MLA1000 system have to be considered - for example the polarization effects which occur at the electrodes while measuring. To obtain a real continuous measurement, two physical disciplines were "married": the electronic and the flow dynamic. With this coaction the continuous measurement of conductivity in flowing aviation fuel of a pipeline is possible now. The geometry of the sensor ensures a laminar flow inside the sensor and thus enables a trouble-free, fast and reliable measurement. This is even more important for such an extremely low measuring range.

The benefits
"With a continuous conductivity measurement and its continuous documentation primarily the reliability of the quality is improved and can be presented to customers by a signed certificate," emphasizes CEO of MBA Hans-Heinrich Westphal the quality feature of the new measurement technology. TransTank confirmed that each step within a working process is nowadays constantly monitored and extremely safe. Nevertheless, the tank farm has tried several times to automate the SDA-dosage in the pipeline to adjust the desired conductivity value and thus to be able to document and certify the entire batch process. The continuously operating measuring system for conductivity in kerosene MLA1000 provides such a solution. The height of the conductivity value of Jet A-1 is continuously monitored and the SDA-dosing is controlled accordingly so that the desired and adjusted value of 250 pS /m is observed and documented by TransTank. This gives TransTank the safety for supplying an aviation fuel, which is approved in this part of the supply chain regarding conductivity.
The special feature
This increased reliability regarding safety reasons meets for sure with customer’s approval. Because due to this possibility, the requirement AFQRJOS (Aviation Fuel Quality Requirements for Jointly Operated Systems) could be supplemented. "The Quality Certificate for the entire batch delivery could therefore be amended to read," says Hans-Heinrich Westphal, CEO of MBA Instruments, and quotes: "Product meets the requirements of AFQRJOS Checklist including (instead of "except") for electrical conductivity."

The procedure
The measuring system MLA1000 is installed in a 400 mm diameter pipeline. The 4-20 mA - signal is connected into a visualization and control system of the control terminal of TransTank. “After start-up the measuring systems operated flawless. Small improvements stimulated by TransTank or initiated by MBA itself, have led to a continuous optimization. The measuring system has been running for two years without any failure. Initially, TransTank has adhered to a 3-month service interval, but they have now extended to clean the probe every 12 months. TransTank continuously measures thus the conductivity value of the delivered aviation fuel from Rotterdam.

At a distance of about 650 km it may well come to a decrease of conductivity which TransTank compensates with fully automatic controlled dosing of additive.

Thus, we document the about 22 hours continuous batch delivery process and prepare the quality and safety optimized supply for Frankfurt Airport", head of the tank farm Klaus Krupka explains the procedure.

The result
With the use of the MLA1000 the company TransTank increases the reliability of delivery by documenting the measured values in each period of delivery and confirming this with a Quality Certificate. The competence of TransTank in dealing with fuels and the skills of MBA in terms of measurement technology have led to such a successful result: automation and documentation with the aim to provide an equal and certified conductivity value in kerosene.

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MLA1000 stationary and continuous operating measurement system

Continuous in-line conductivity measurement of kerosene

The continuous measurement system MLA1000 utilises the flow speed within a pipeline. While a flow of 0.5 – 7 m/s exists within the pipeline itself, the internal flow speed of the measuring probe is reduced by the small size of its in-flow and out-flow openings.

Accordingly, the resulting laminar flow between the two electrodes within the probe permanently suppresses the polarisation, yielding highly accurate, real-time conductivity and temperature values.

As with the MLA900 the functional testing on the MLA1000 involves the placement of a magnet that closes the test contact, showing a pre-set reading on the display. The additional use of dismanteling muffle (optional) allows the probe to be removed during pipeline operation.

TECHNICAL DATA / MLA1000
• Conductivity: 5 to 2,000 pS/m, expandable to 5 to 10,000 pS/m, with simultaneous temperature measurement in °C
• Function and status readings
• Display unit MLA1000-A: Esc II 2(1)G Ex de [ia Ga] IIB T4 Gb
• Probe MLA1000-S: Ex II 1G Ex ia IIB T4 Ga