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NATO STANDARD

AFLP-7011

**AUTOMATED FUEL SYSTEM
MONITORING AND CONTROL
EQUIPMENT**

**Edition A Version 1
NOVEMBER 2016**



NORTH ATLANTIC TREATY ORGANIZATION

ALLIED FUELS AND LUBRICANTS PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

NATO STANDARDIZATION OFFICE (NSO)

NATO LETTER OF PROMULGATION

29 November 2016

1. The enclosed Allied Fuels and Lubricants Publication AFLP-7011, Edition A, Version 1, AUTOMATED FUEL SYSTEM MONITORING AND CONTROL EQUIPMENT which has been approved by the nations in the PETROLEUM COMMITTEE (AC/112), is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 7011.
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Director, NATO Standardization Office

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SECTION 1 GENERAL

0101. The aim of this agreement is to establish minimum design and performance standards for automated liquid level monitoring and control equipment for fixed fuel storage tanks.

0102. Participating nations agree the minimum design and performance requirements for automatic tank gauging (ATG) and remote readout equipment in this AFLP, and agree to the technical requirements in Section 2 as a minimum.

0103. The requirements for automated control equipment in this AFLP apply to all types of fixed fuel storage tanks. Nations should use the requirements in this AFLP when they elect to incorporate an automated capability in the design for new storage tanks or when they elect to install automated equipment in existing storage tanks.

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SECTION 2 DESIGN AND PERFORMANCE REQUIREMENTS FOR AUTOMATED FUEL SYSTEM MONITORING AND CONTROL EQUIPMENT

DEFINITION

0201. **Monitoring Equipment.** The term refers to automatic liquid level measuring equipment installed in fixed aviation fuel tanks and the ancillary equipment that provides a remote readout of selected information of the tank contents, e.g., volume, temperature, flow rates, etc., where temperature measurement is a national option. This is defined as the automatic tank gauge (ATG) system.

MONITORING EQUIPMENT DESIGN AND CONSTRUCTION

0202. **General.** The monitoring equipment shall be capable of operating within the accuracies, limits and requirements below.

0203. **Safety.** The ATG shall comply with all applicable requirements of a nation's work safety, fire protection, and electrical codes concerning hardware installation in petroleum storage areas. The ATG shall be intrinsically safe and shall be compatible with any installed cathodic protection system. All electrical equipment used to install the ATG system in areas where explosive fuel vapours may be present or where volatile fuels are handled, shall be approved for use as established by the nation's electrical code. Also, the ATG system shall have lightning and electrical transient protection.

0204. **Electrical Power.** The ATG shall operate with power from commercial sources or any alternative power source, i.e., emergency generators. The ATG shall require no more than 3 amp maximum current demand. Power wiring is to be located a suitable distance from the signal wire to prevent electrical interference.

0205. **Environmental Requirements.** The ATG shall be capable of withstanding the pressure, temperature, and other environmental conditions likely to be encountered in service. Relative humidity requirements shall range from 0 per cent to 100 per cent for a tank installed system.

0206. **Performance.** The ATG system shall provide accurate level measurement and product condition date, by location and product grade, in above and below ground storage tanks. The system shall, if specified, be capable of determining the volume or level of water present in the tank. In addition, the ATG system shall have sufficient dynamic response to track the liquid level during maximum filling or emptying rates. Digital data transfer shall use American Standard Code for Information Interchange (ASCII) character set (or a nation's equivalent protocol) between the ATG system and the base remote collection point and include a graphical user interface (GUI) to operate in the base's remote microcomputer.

0207. **Accuracy.** Fluid level measurements from the true surface level to the display level indicator shall be accurate to ± 1.0 mm. ATG shall provide the average temperature of the product and measure within ± 0.5 degrees Celsius of the actual temperature of the product.

0208. **Displays.** Located at each operating site shall be a local display device giving the volume (correct to 15 degrees Celsius) of the product in the tanks in litres or cubic metres; the level measurement in metres and mm (one mm increments); the temperature in 0.5 degrees Celsius increments; and if desired, the volume or level of water present. An audible alarm capability shall provide two sets of audible alarm conditions: high level and low level. Located in each facility supporting a grouping of storage tanks shall be a display of the items above, plus a display of the total volume (corrected to 15 degrees Celsius) of the grouping of tanks in litres or cubic metres. If multiple products are stored in the grouping, the total volume (corrected to 15 degrees Celsius) shall be segregated by product for each grouping of tanks.

0209. **Compatibility.** Materials used in the construction of the ATG system shall not be degraded by exposure to the product or the product's vapour. The materials used shall also not have any deleterious effect on the quality of the product stored. When the ATG is installed in an aviation fuel tank, the metals and alloys used in the ATG shall be corrosion resistant, treated to resist corrosion, or, where necessary, protected by an aviation fuel compatible coating such as epoxy (MIL-PRF-4556) or an equivalent national approved coating. Copper, copper alloys, light metal alloys containing more than 4 per cent copper, zinc or zinc alloys, cadmium, or lead or lead alloys shall not be used in components exposed to the fuel.

0210. **Installation.** The location of ATG hardware within a tank can affect system accuracy during operation. The ATG system shall be located away from tank inlets and outlets and a sufficient distance away from pumps to insure that fuel turbulence and swirl do not cause accuracy limits to be exceeded.

0211. **Calibration.** The ATG system shall have the capability to be self-diagnostic and self-compensating.

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